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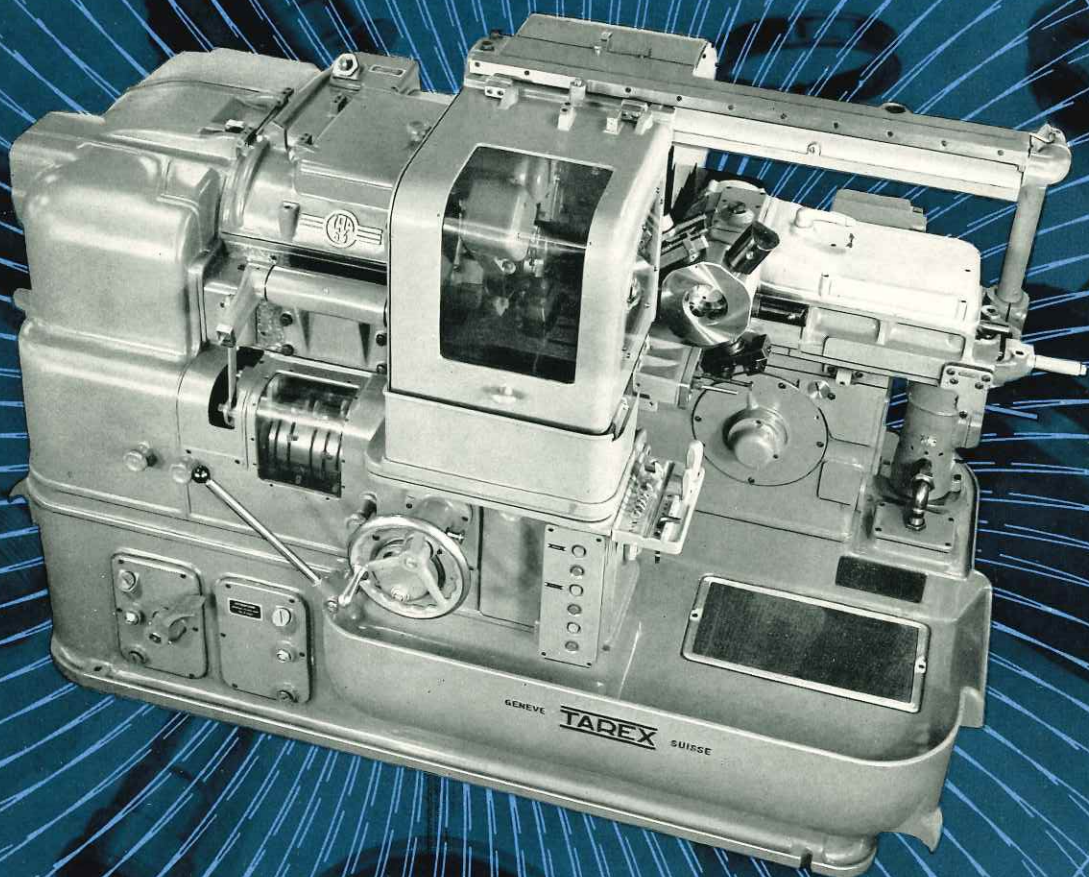
TAR-H



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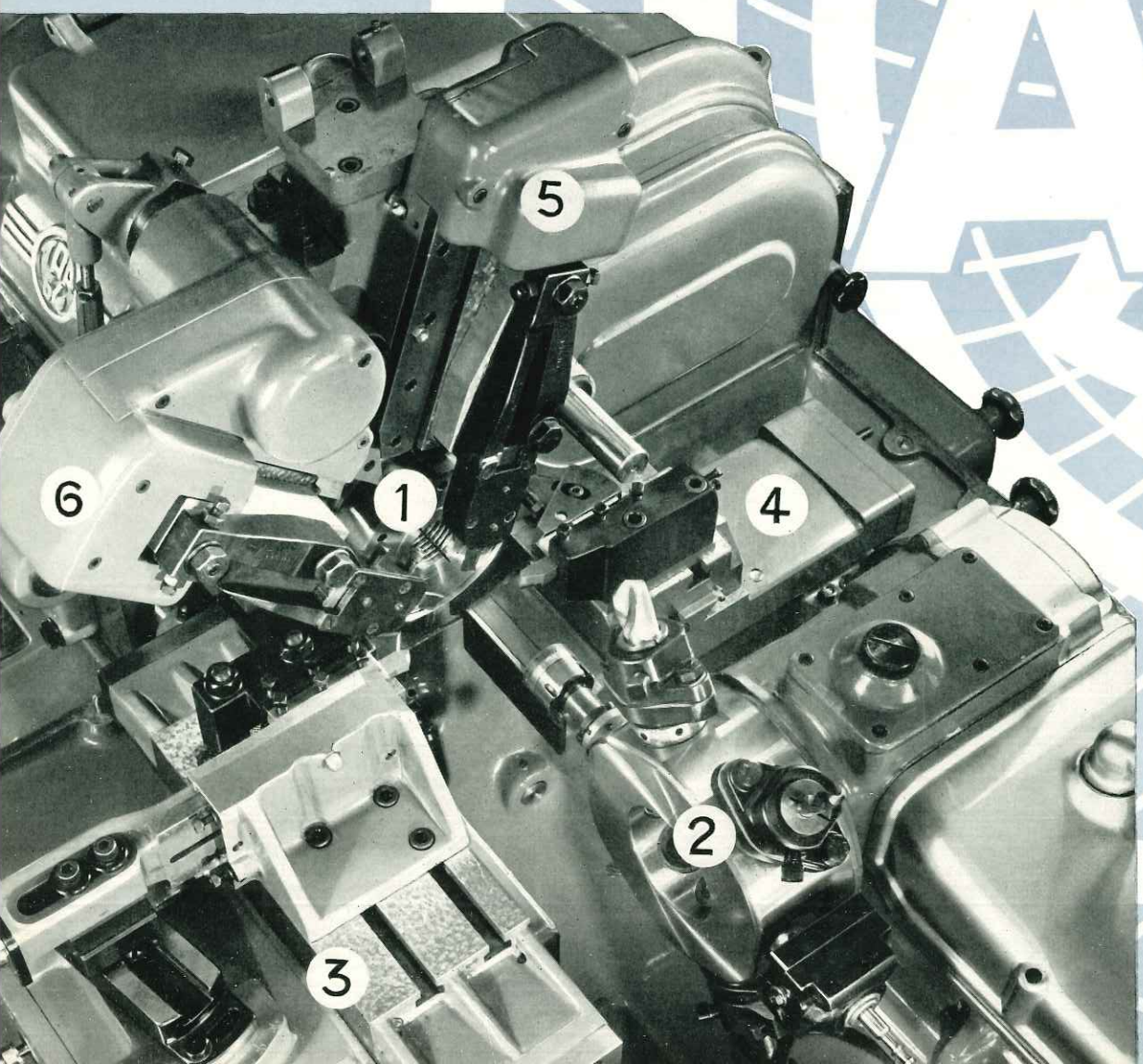
82 - Catalog

TAR-H

Machine Tool Co.
Philadelphia Pa.
May 1st 1958



THE TAREX FORMULA

A high **precision lathe,** powerful and accurate.

The only single spindle automatic turret lathe with all the following features:

1. **Universal spindle** for **bar** work and chucking.

2. Six or eight **position turret.**

3. **Compound slide design of the front slide.** Both movements cam controlled. Simultaneous turning and taper turning or from copying.

4. **Compound slide design of the back slide** with cam operated transverse movement. The longitudinal slide can be controlled by the advancing turret or by a template to machine open flat cones or similar shapes.

5. **Vertical slide** with longitunal adjustment.

Complete independence of the movements of the slides and of the turret.

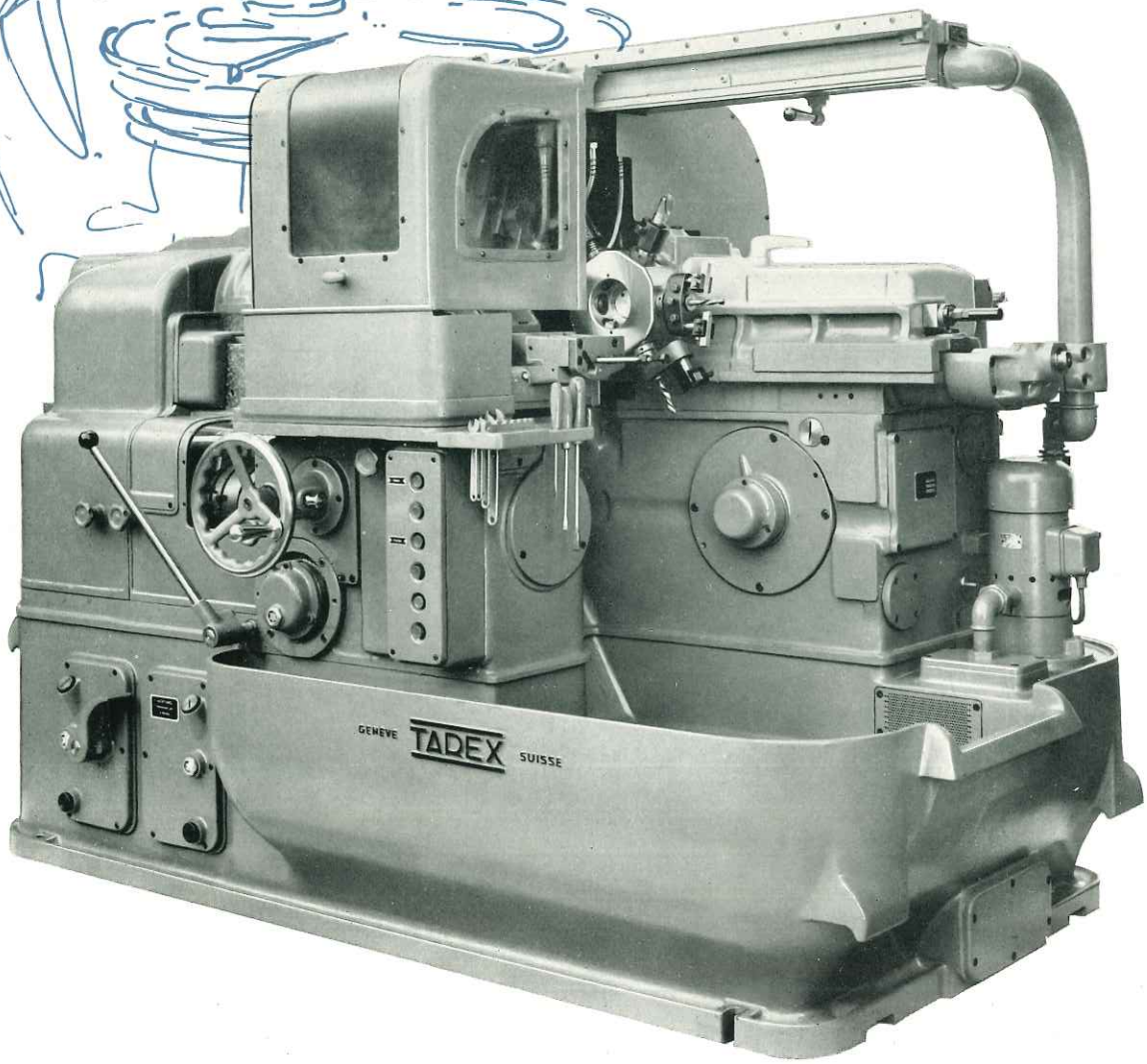
Slides operated by **standard flat cams** and levers with adjustable ratio. All controls are mechanical.

Auxiliary shaft and **accelerator** to minimize idle time.

6. **Standard attachments for special purpose:** 4th slide, or thread chasing attachment independent of other slides and from the turret.

Many accessories such as swing stop, high speed drilling, multiple drilling, multiple tapping, side drilling and tapping, cross milling, spindle brake, etc.

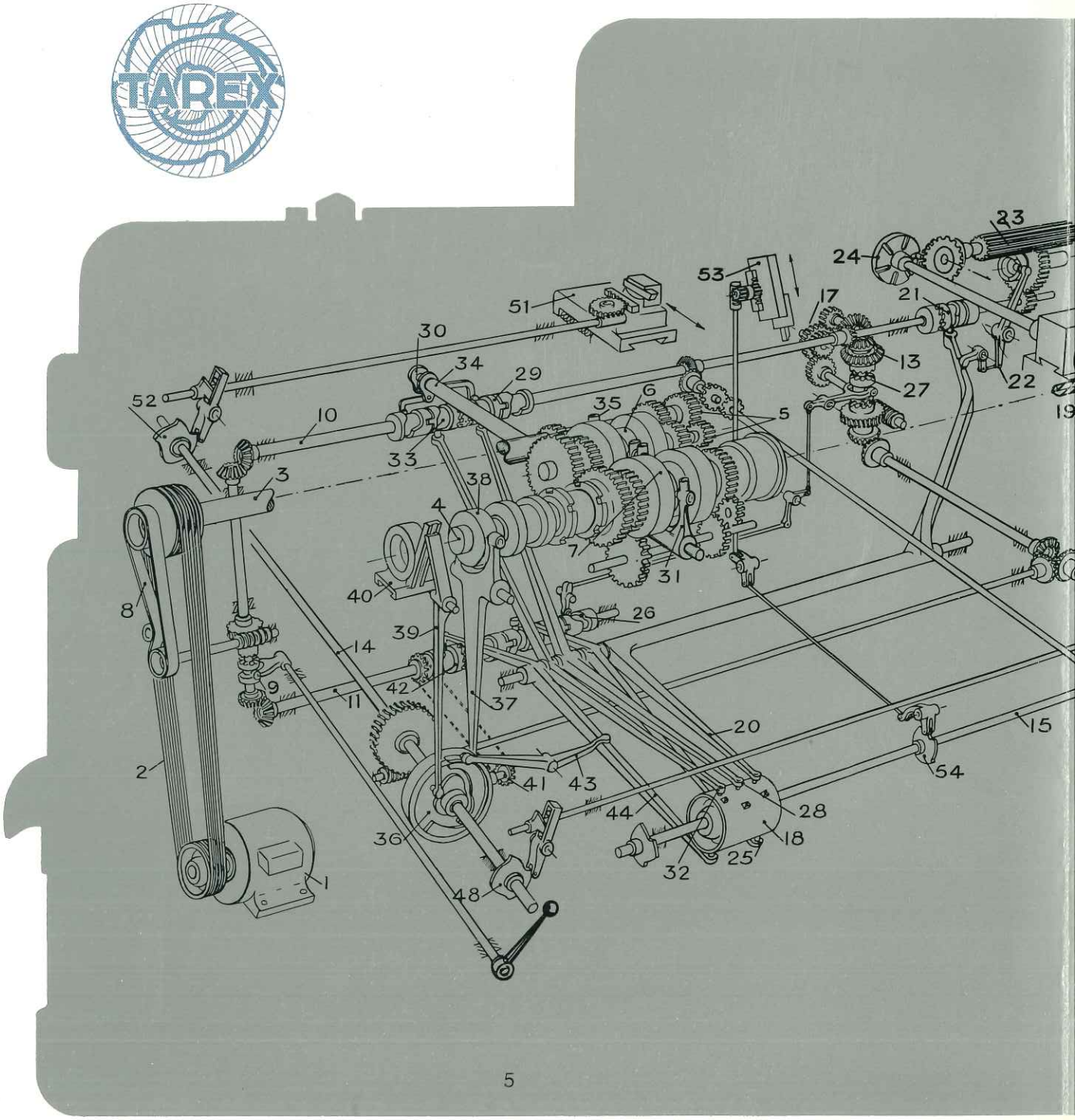
Tarex – a password for precision



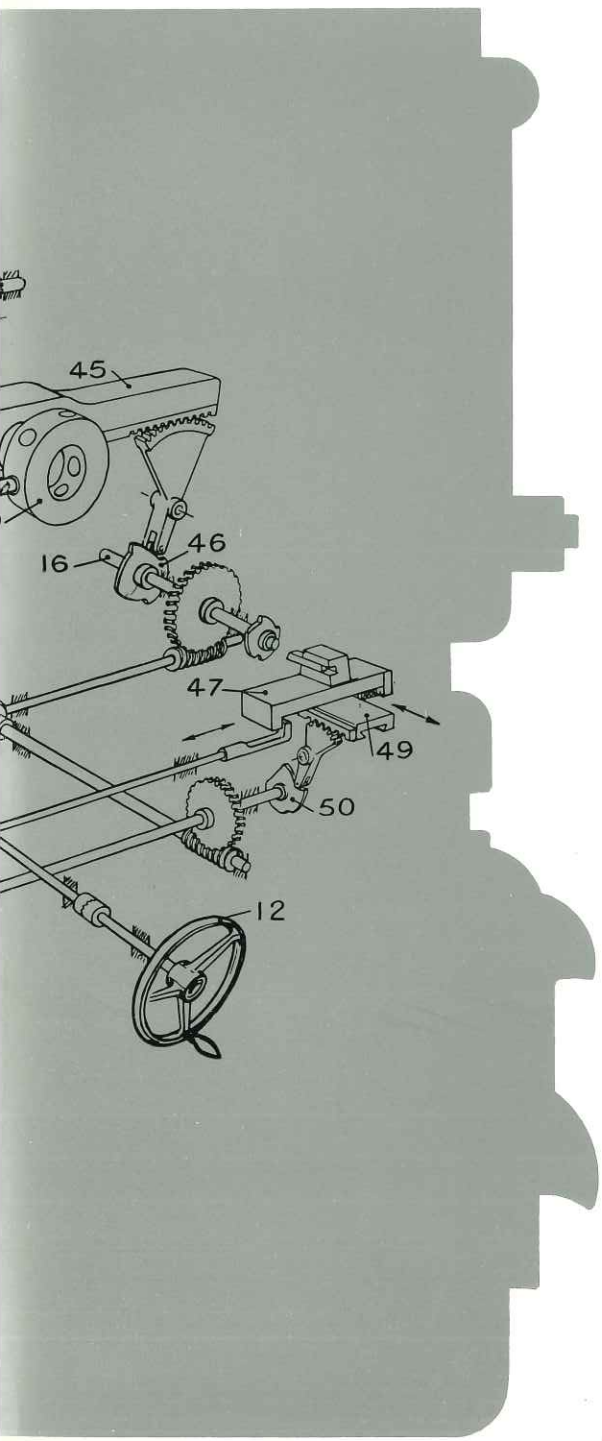
OPERATION OF TAR-H

The diagram shows the moving parts of the lathe.

The motor (1) drives the headstock assembly through four V-belts (2) and the jack shaft (3). The work spindle (4) is driven by a set of gears distributed on four parallel shafts, and by two double cone clutches. Gears (5) are interchangeable in pairs for speed changing (4 automatic speeds to each pair). High to low speed—through first clutch (6) mounted on idler shaft parallel to spindle. Reverse rotation—through second clutch (7) mounted on work spindle. All shafts controlling the automatic movements of the lathe are driven from the jack shaft by a flat belt (8)



which operates as a safety. A hand clutch (9) puts the backhafts (10) and (11) in motion. These backshafts can also be rotated manually with handwheel (12). The rotation of the backshaft (10) is transmitted to the camshafts through a 2-speed gear box called the accelerator (13). The camshafts, namely transverse camshaft (14), timing shaft (15), and turret camshaft (16), can run at two different speeds: The accelerated speed with the accelerator driven straight from backshaft and the working cycle speed with the accelerator working through the timing gears (17).
Trip dogs on a carrier drum (18) control the following operations:



1. **Turret indexing** (19) — through trip lever (20), dog clutch (21), delaying action lever (22), sliding pinion (23) and Geneva cross (24).
2. **Accelerating cam shafts — from working speed to accelerated speed** — through trip lever (25), dog clutch (26) and throw-in clutch (27).
3. **Reversing workspindle** — through trip lever (28), dog clutch (29), operating clutch shifters (30) and (31), and reverse clutch (7).
4. **Speed change, workspindle** — through trip lever (32), dog clutch (33), operating clutch shifters (34) and (35), and high-low clutch (6).
5. **Chucking, feeding or ejection** — The chain driven (41) cam carrying plate (36) idles on transverse camshaft (14). Its rotation is controlled by dog clutch (42), delaying action lever (43), and trip lever (44). Cams mounted on both faces of plate (36) synchronize chucking through lever (37) and cam ring (38) with feeding through adjustable lever (39) and feed slide (40).

   Operation of the slides is also illustrated: Turret slide (45) by cam (46). Compound front slides (47) and (49): Longitudinal motion by cam (48) and transverse motion by cam (50). Back slide (51) by cam (52). Vertical slide (53) by cam (54).

DESIGN FEATURES

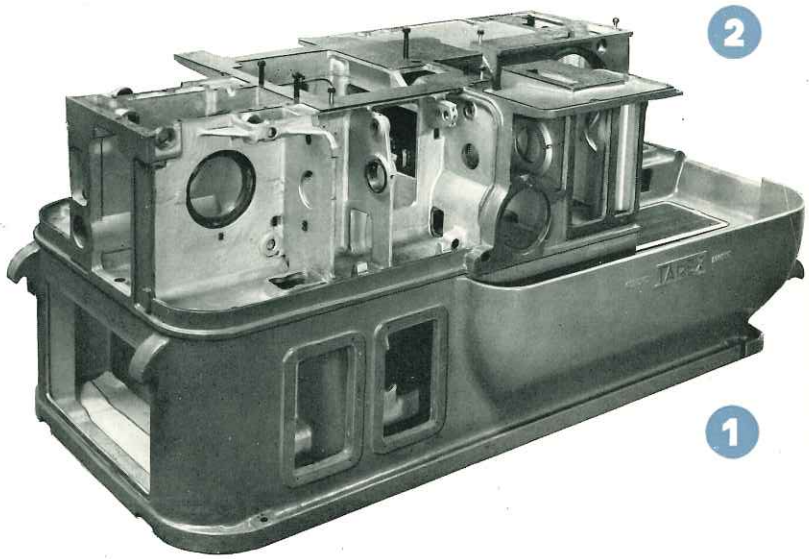
Accurate work is impossible without a stable base. The ribbed box design of the base and bed is the acme of rigidity.

THE BASE

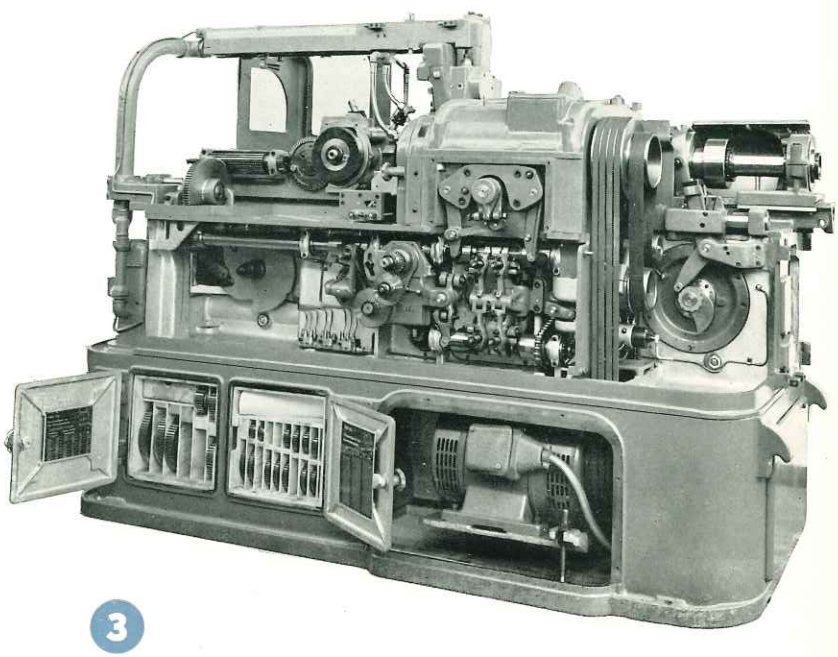
is designed to accommodate, between its ribbing, the electric motor, the lubricating and coolant reservoirs and the change gear cabinets, with a minimum number of openings thereby insuring rigidity (**1**).

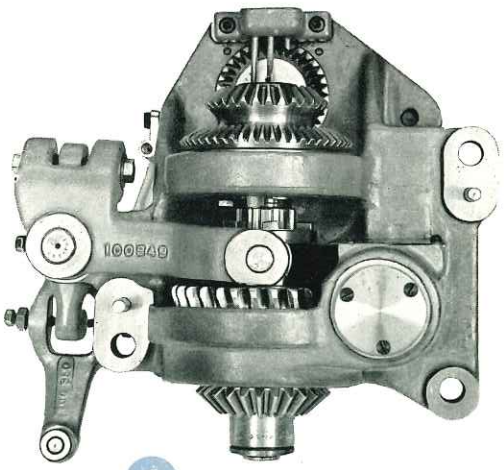
THE BED

is a more intricate box casting (**2**). It is stress relieved after rough machining to prevent subsequent deformations through heat stresses. The contact faces between bed and base are hand scraped to a perfect fit, and the two parts form a solid block when assembled. Chip disposal —a major problem for lathes of this capacity—is insured by a steep chute cast in the bed with a generous chip pan in the base.



In a modern automatic machine, all mechanisms must be easily accessible while the rigidity of the design is maintained. The solution to these seemingly contradictory conditions appears on this page. The top photograph (**2**) illustrates the base and bed assembled and the lower picture (**3**) shows the back side of the finished lathe, with the guards removed.



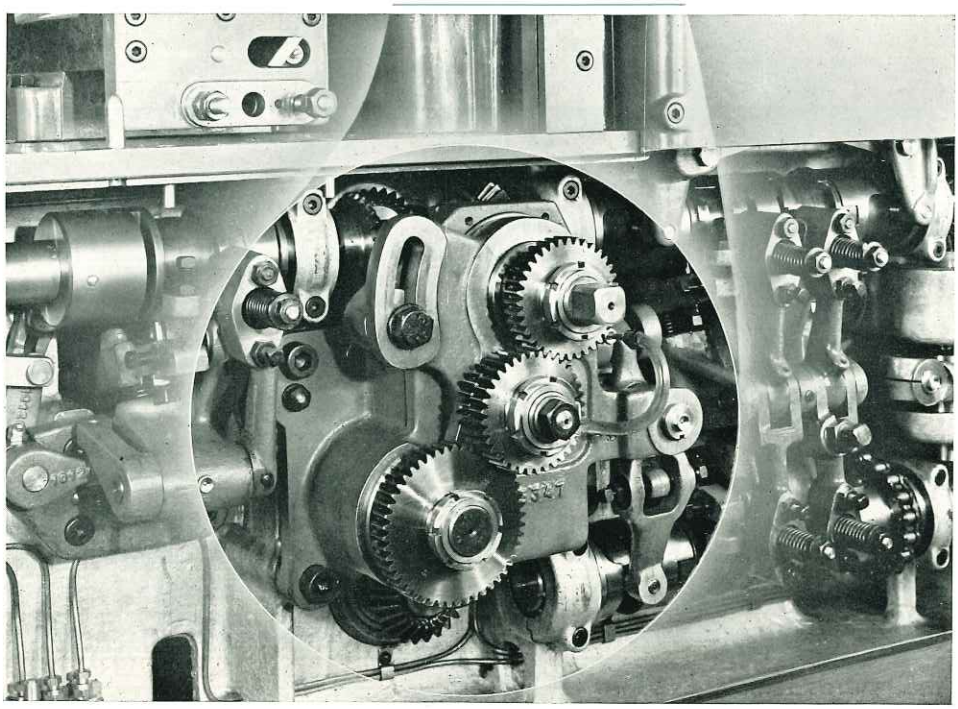


4

The efficient operation of automatic movements depends entirely on careful fitting and mounting. TAREX divides the machine into several groups or subassemblies which are fitted on the workbench. The subassemblies are mounted and positioned on the machine by bolts and dowel pins and can be readily removed as independent units.

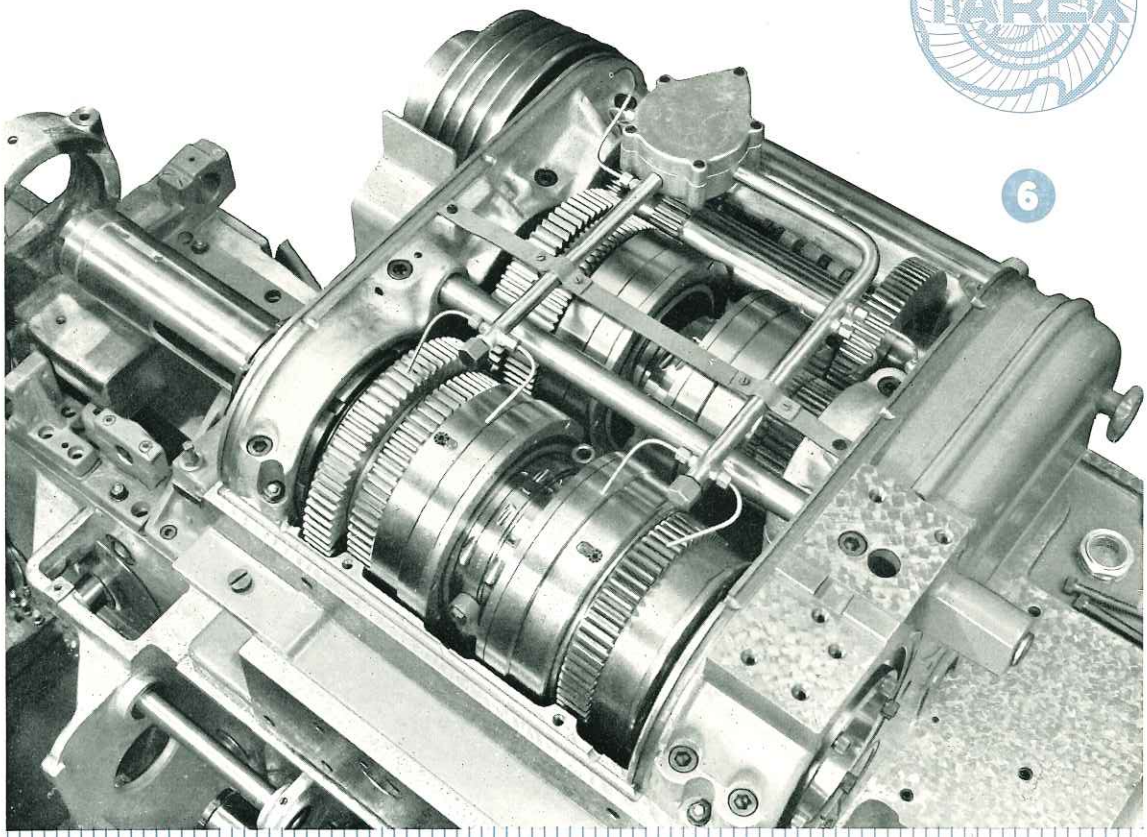
Here, for instance, is the mechanism accelerating the camshafts, seen from the inside (**4**) and the same unit (**5**) mounted on the bed, with timing gears in place. The shaded portion of the photograph illustrates the shifter and locking blocks for the dog clutches. These items can be readily removed with their respective shafts by removing the bearing caps.

TAREX



5

THE HEADSTOCK



6

When the rotation of the spindle is suddenly reversed, the inertia of heavy bars or of massive chucking parts develops considerable and repeated shock loads on the gears in the headstock. The whole assembly must be built to withstand these strains and retain its original accuracy without excessive wear.

The headstock body and the bearing caps are stress relieved after rough machining. All gears are hardened and ground. They are mounted on short, stubby shafts running in selected anti-friction bearings to eliminate vibrations (**6**).

The front spindle bearing has two rows of rollers with adjustment of the radial play. The thrust is taken up by the back bearing (see diagram **9**, page **11**). In this way the desirable close fit of the bearings is not affected by the expansion of the spindle. Cone clutches are used, because they are more positive than any other design. Automatic reversing is accurate and plain taps and button dies can be used for blind holes or against shoulders.

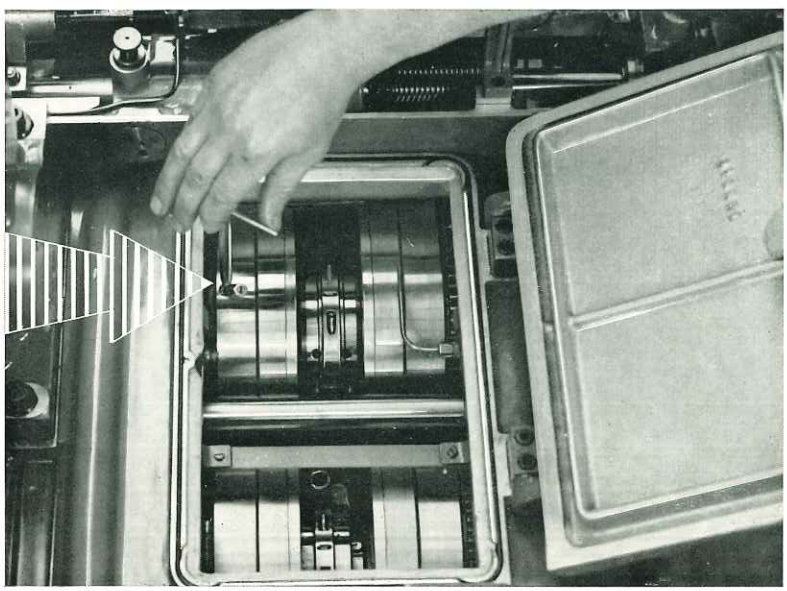
THE SPINDLE

is the heart of the lathe. TAREX gives preference to nitriding steels for getting better spindle rigidity. Forgings are of high quality and individually inspected. After roughing, the spindle is heat treated to increase resilience. It is then ground twice, nitrited, and finish ground (**7**).

TAREX's spindles are not individually fitted at assembly. Though the accuracy of the parts produced on this automatic lathe is guaranteed to .0005", TAREX spindles are interchangeable.

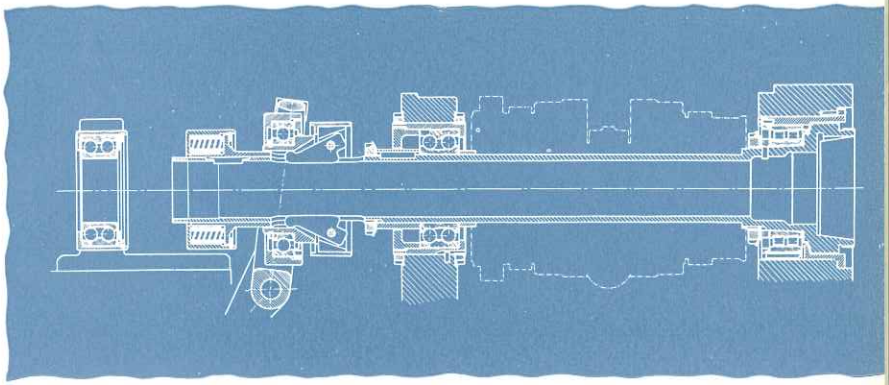
All rotating parts in the headstock are balanced to avoid vibrations and insure a high microfinish even at high speeds. Any of the four clutches can be adjusted for wear with one wrench only (patented) (**8**).

7



8

The spindle design will take, without modification whatsoever, either collets, a mechanical chuck, expanding mandrels or a pneumatic chuck. In all cases, except for the pneumatic chuck, chucking is effected by conventional chucking levers which are perfectly matched to avoid unequal thrust (**9**).



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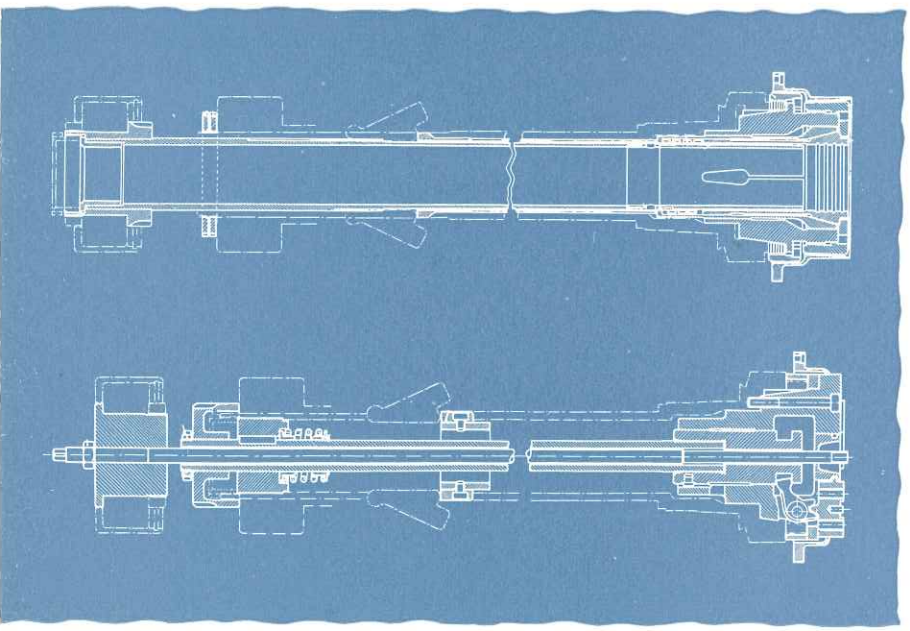


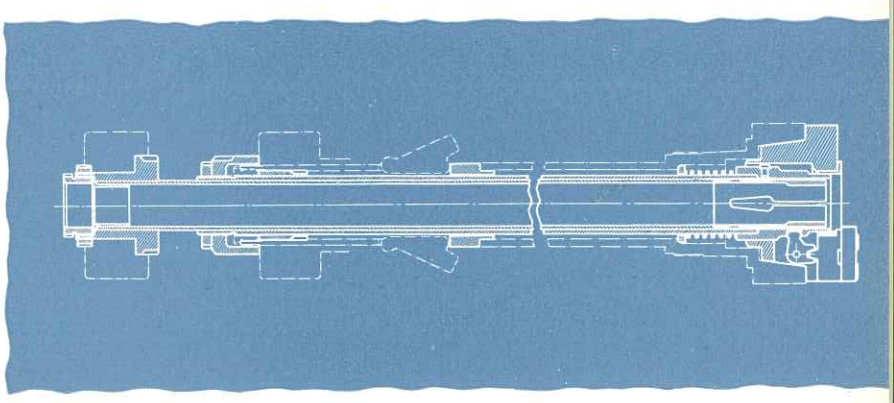
10

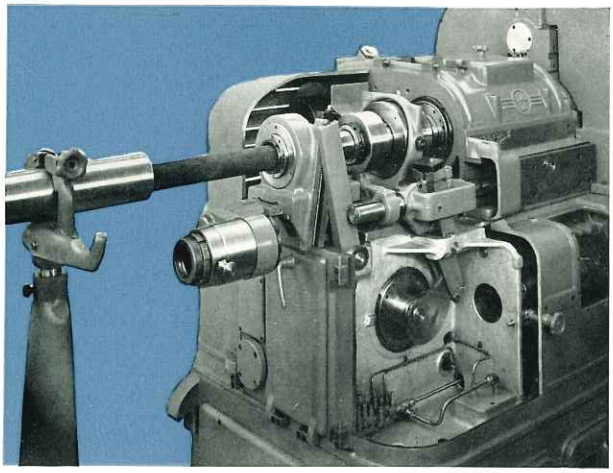
Collets are always seated against the ground spindle cap. They open and close without longitudinal movement. Longitudinal limits can thus be held irrespective of the commercial tolerances in the diameter of cold rolled bars (**10**).

The thrust developed by the chucking levers can be reversed. This pull is applied to plain (**10**) or hollow (**11**) mechanical toggle chucks. The pull is also applied to certain types of expanding mandrels. Chucking levers are adjustable for variations in the chucking diameters within the limits shown in the specification at the end of this catalogue.

Bar feed is conventional, with automatic and adjustable bar feed equipment inside the spindle (**11**).

11





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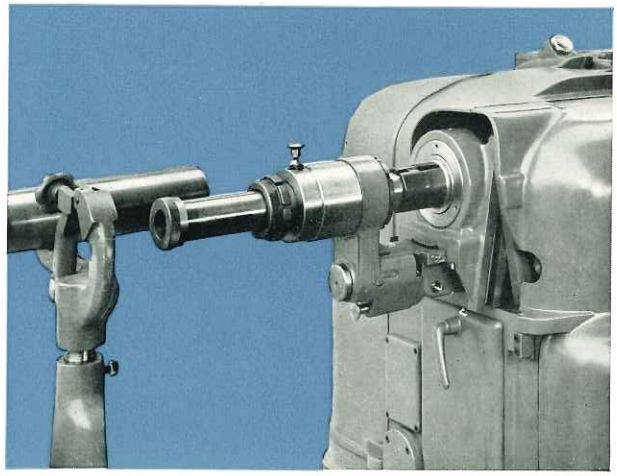
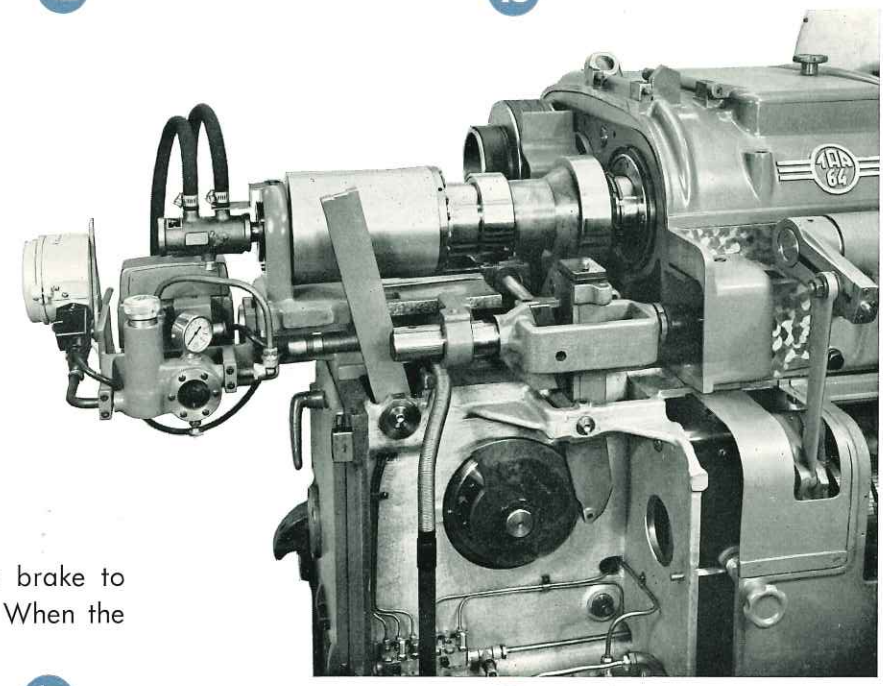


13

An outside feed attachment is available for bars of heavy section (**12-13**). When a bar of stock has been used up, the machine automatically stops. When equipped as a chucking machine, or for second operation work, the lathe can also be stopped at the completion of each cycle.

The spindle is fitted with a brake to reduce unproductive times. When the lathe operates as a chucker, the feeding mechanism can be used for the positive ejection of parts.



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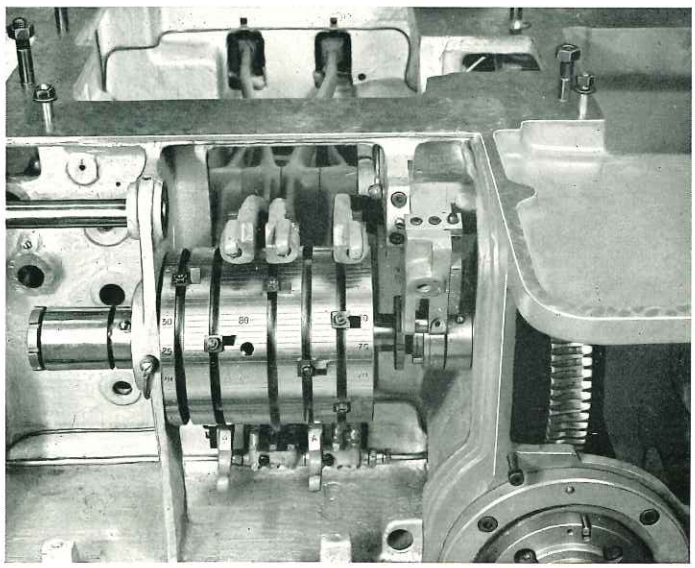


Pneumatic chucks are operated by an air cylinder at the rear of the spindle (**14**). Should the pressure fall below 60 PSI, the lathe automatically stops.

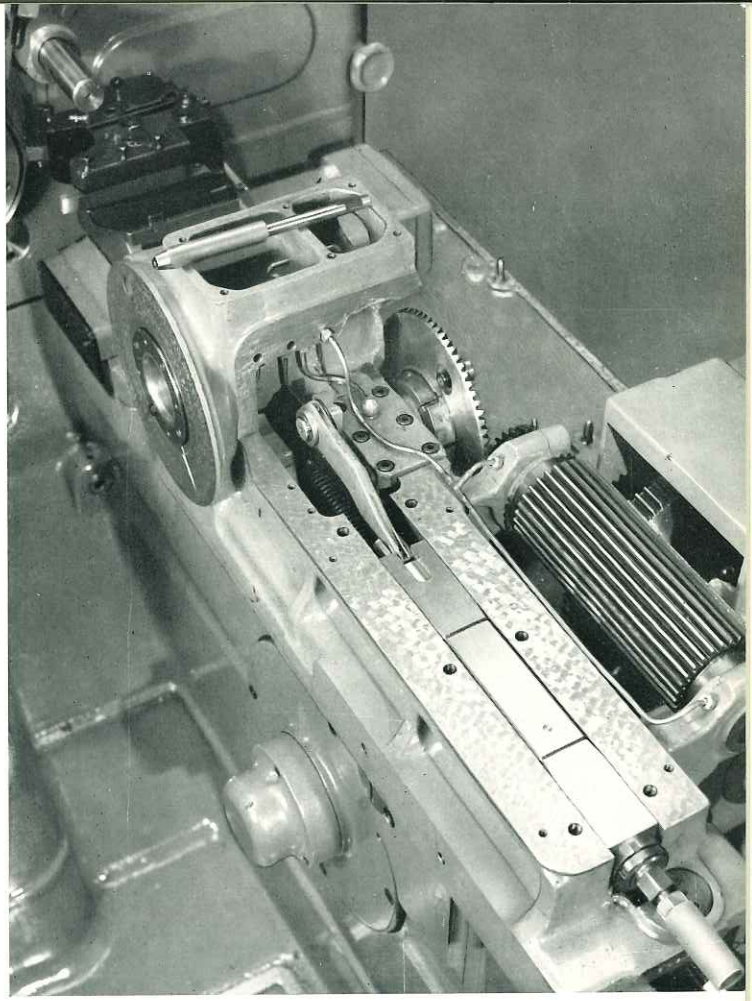
The synchronization of the feeding and chucking operations with the other automatic movements of the cycle is accomplished by separate trip dogs conveniently located on the timing drum (**15**).

THE SLIDE

THE TURRET SLIDE

is activated by two distinct and independent movements: advance and withdrawal to and from the work which is cam operated, and indexing, which is done with a Geneva cross.

The turret tools often develop very heavy working loads. Therefore the turret slide is massive with a long bearing surface to withstand these loads without excessive wear, chatter or wedging (**17**). The slide is of special alloy iron, normalized and hand scraped on all bearing surfaces. A taper gib is provided for adjustment.



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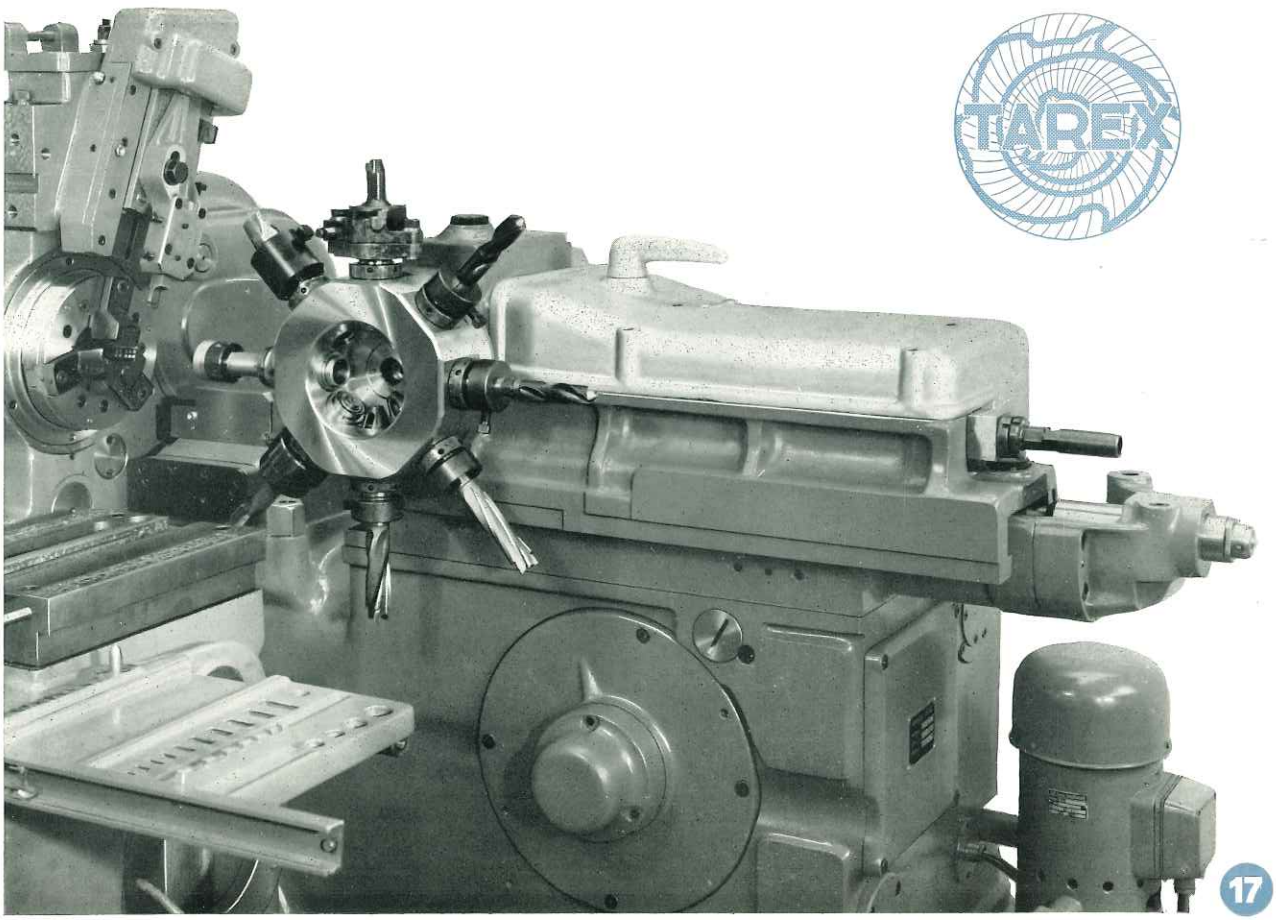
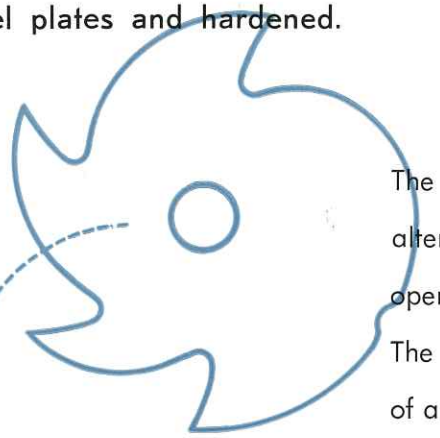


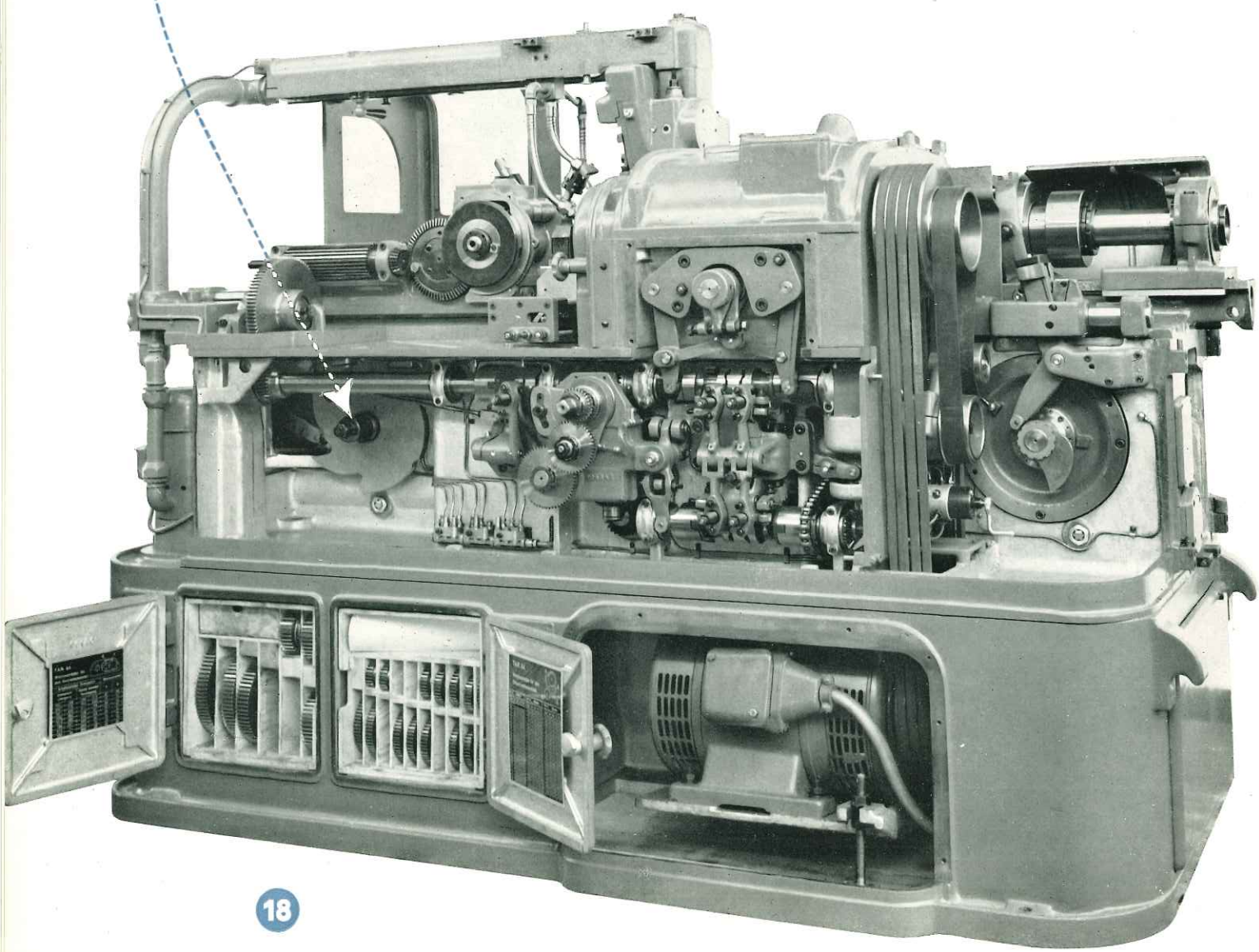
17

The flat cams actuating the tools are cut from steel plates and hardened.



The flat cam is cheap to produce, quick to install and easy to alter. The feed of each tool can be selected for most efficient operation without any restriction (**18**).

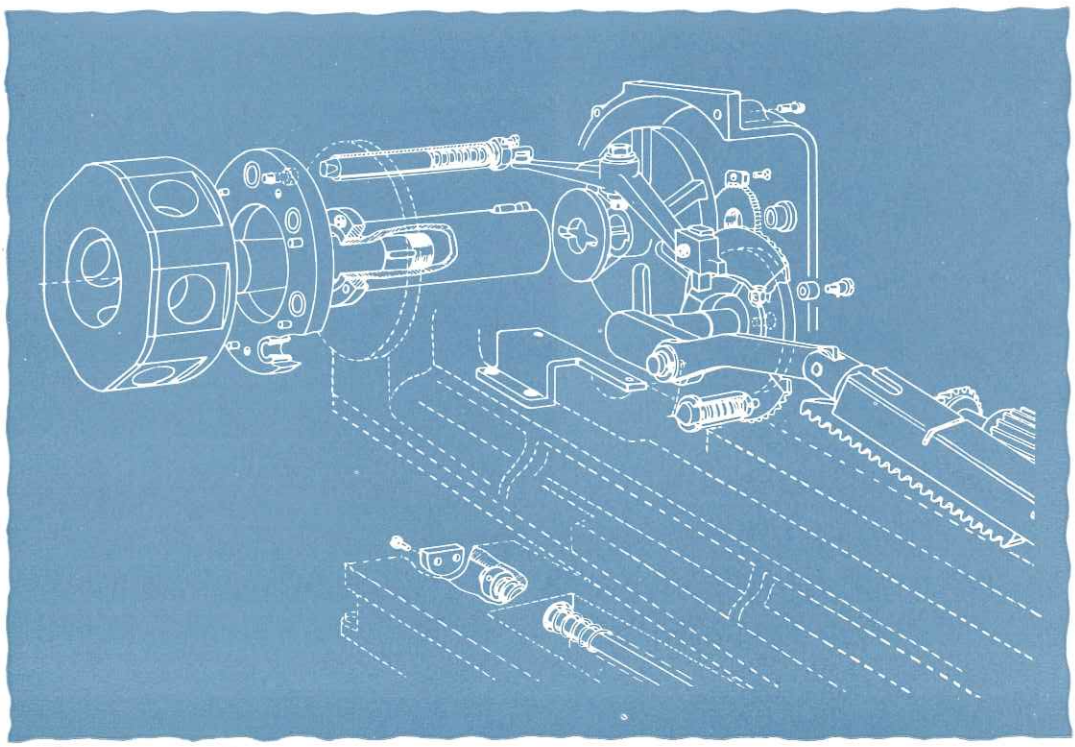
The turret indexes under the combined action of a crank and of a Geneva cross (**16**). Indexing is synchronized with the lobes of the cam by the trip dogs on the timing drum.



18

The turret begins to move as soon as the trip dog lifts the lever of the indexing dog clutch. A delaying action mechanism keeps this clutch engaged until indexing is completed. The crank is then secured by a latch. Turrets are available with either 6 or 8 tool positions. The turret shank is taper ground and revolves in a special grey iron sleeve, adjustable for wear, in the turret slide. Both the backplate of the turret and the taper bearing must bear perfectly if precision is to be maintained under repeated shock loads. These parts are hand scraped in pairs.

Rigid locking of each tool position is as important as the fit of the turret. The TAREX lockpin is lapped in a sleeve, adjustable for wear and its tapered tip registers perfectly with the tapered holes of hardened bushings in the backface of the turret. Each tool is held in its proper position without any play; this is essential to avoid chatter and guarantees accuracy (**19**).



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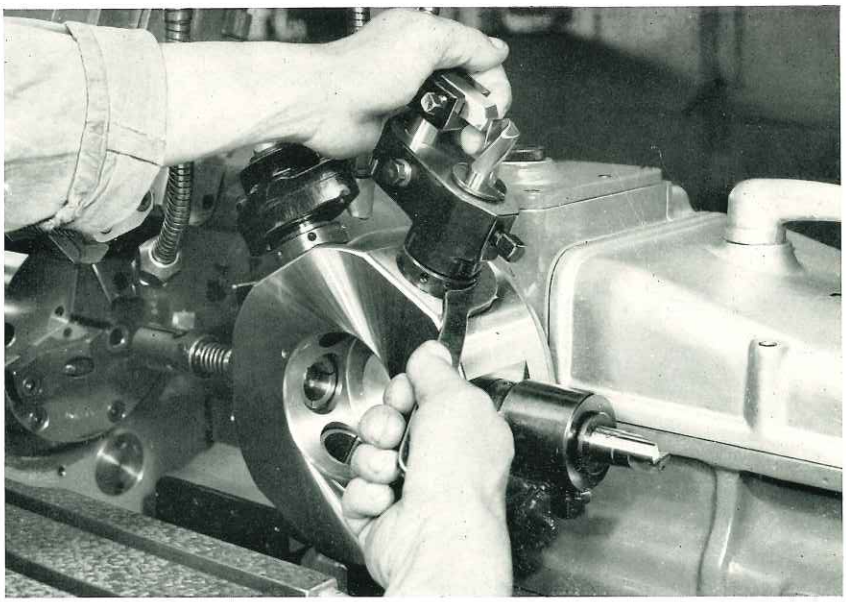

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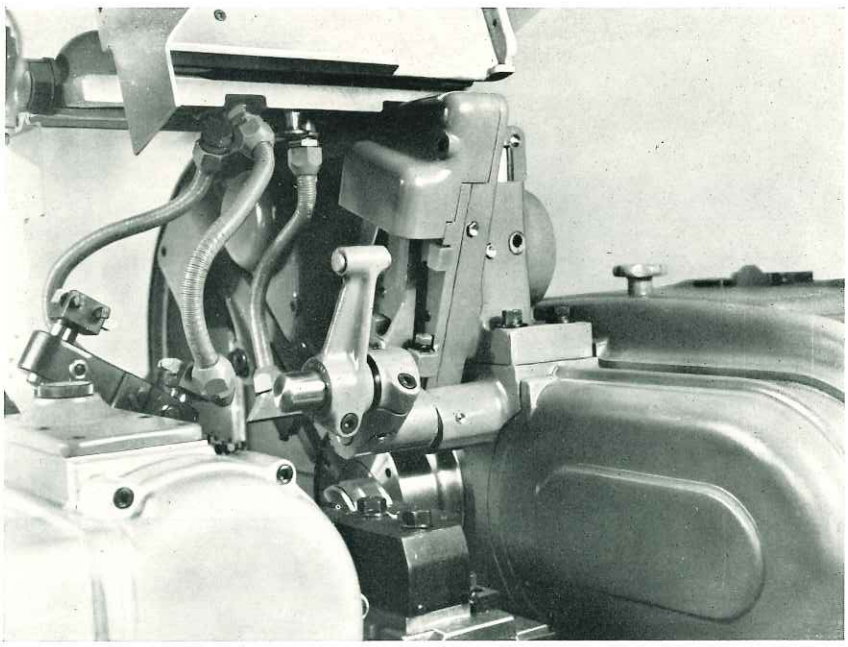
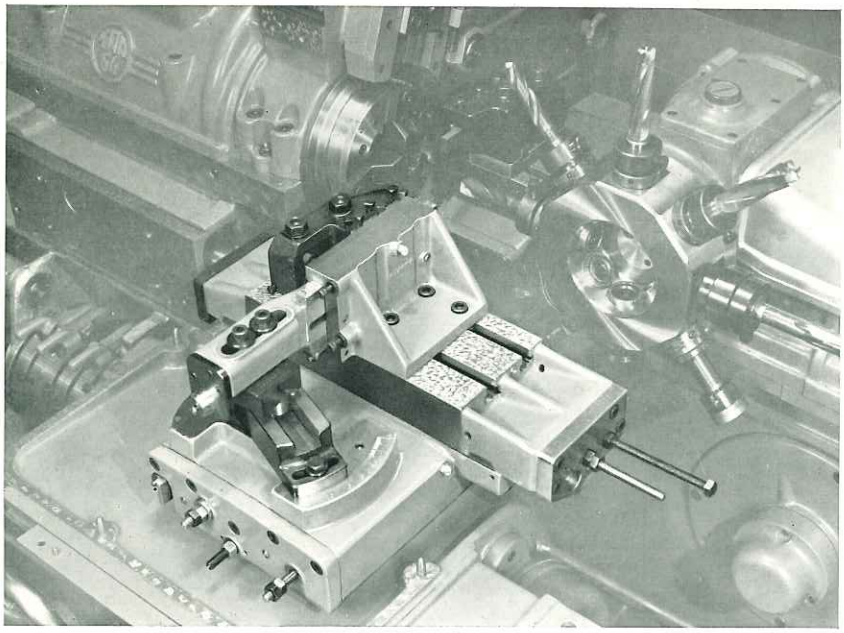


21

The 1-1/4" diameter shanks of tools or toolholders are locked in position in the turret holes with concentric locking bushings (patented). While conventional cross locking devices often mar the tool shanks and impair the fit of the turret face, the concentric locking bushing insures perfect centering with no cross strain (**20**).

One turret position is usually allocated for the stock stop. This can be freed for tooling by the addition of a swing stop, supplied with an additional cost, which can be mounted at any time without special fitting (**21**). The swing stop attachment automatically synchronizes with the feeding mechanism.

THE FRONT SLIDE



22

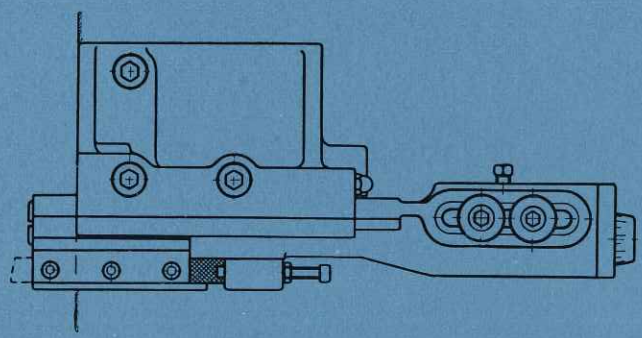
is of the compound slide design, with the transverse motion below the longitudinal motion (**22**). This patented arrangement makes single point tooling easy, which is preferable to form tools, because form tools are expensive, operate slow, and are difficult to sharpen. Both slides are exceptionally heavy and made of selected, wear resistant, stress relieved alloy iron. All sliding surfaces, including those of the taper gibs are hand scraped to a perfect fit for long wear.

The cross motion is transmitted from the cam to the tool through a solid lever with toothed segment and rack. The longitudinal movement is obtained from another cam independent from the cross cam through a lever with arm ratios adjustable between 1 : 1 and 1 : 2.5.

Positive stops limit the movements of the tools. Fast and accurate seeting is accomplished by micrometric adjusting screws.

This complete independence of the two motions permits quite a selection of combined operations, for instance:

23



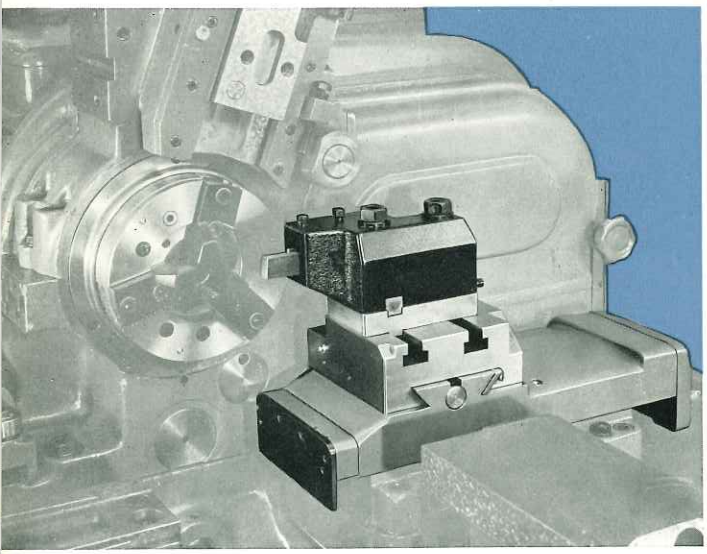
Standard sliding toolholder, type CH 801, for front slide

1) Rough and finish turning.

2) Taper turning with a sliding toolholder (**23**) guided by a straight edge.

3) Contour tracing by replacing the straight edge with a template.

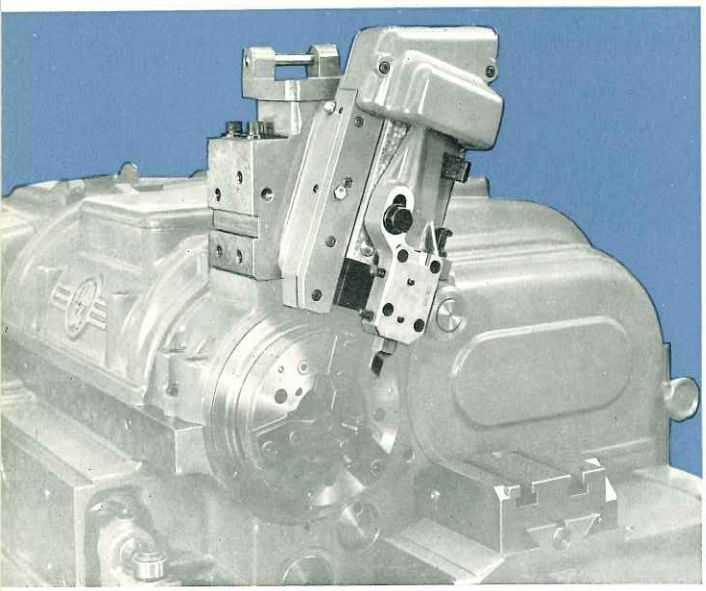
4) Combined turning and taper or tracer turning.



THE BACK SLIDE

also a compound slide, is designed similar to the front slide including adjustable taper gibs. The cross movement is operated by cam and lever with arm ratios adjustable between 1 : 1 and 1 : 2.5. The longitudinal motion can be actuated from the turret, or from a template to turn open tapers or similar shapes (**24**). Cross movement of the tool is limited by positive stops. Accurate tool setting is accomplished with a micrometer setting screw.

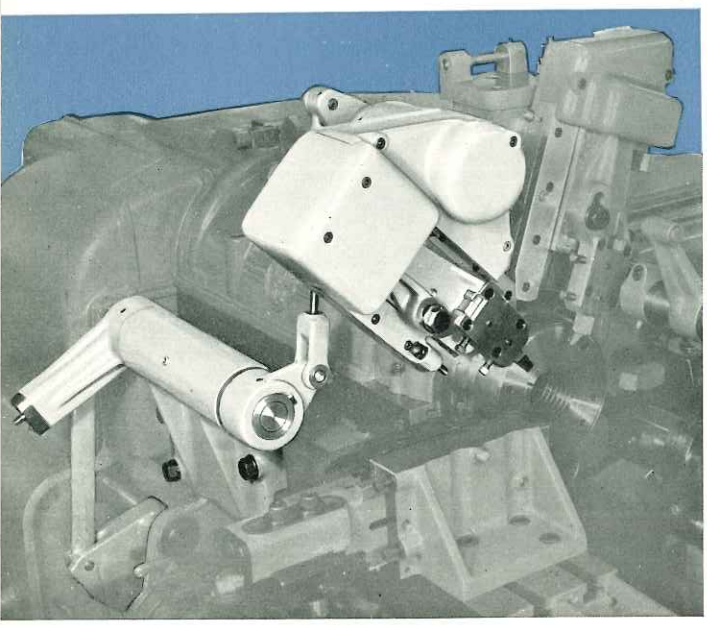
24



THE VERTICAL SLIDE

is tilted backwards 20° to allow more space for the standard attachments operating between front and vertical slides. The slide is of selected alloy iron, hand scraped with its taper gib. The cross feed is from a cam with adjustable lever ratios between 1 : 1 and 1 : 2. The slide, with its adjustable stop, will take a toolholder as iillustrated (**25**). By exchanging the toolholder the slide operates as well in either spindle direction. The whole slide can be displaced parallel to the spindle center line to set the tool accurately in relation to te spindle nose. Spacers (up to 2") can also be inserted between the toolholder and the slide to advance the tool still further for chamfering or similar light work.

25

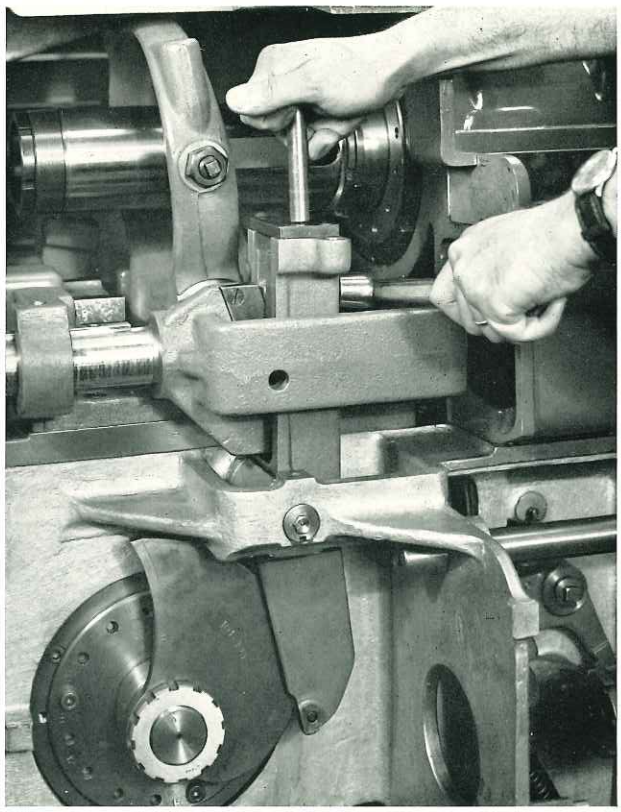


THE FOURTH SLIDE

is an attachment (described in a separate leaflet) which mounts without additional fitting on the prepared face located on the front of the headstock. It is used for grooving, chamfering or similar work (**26**).

26

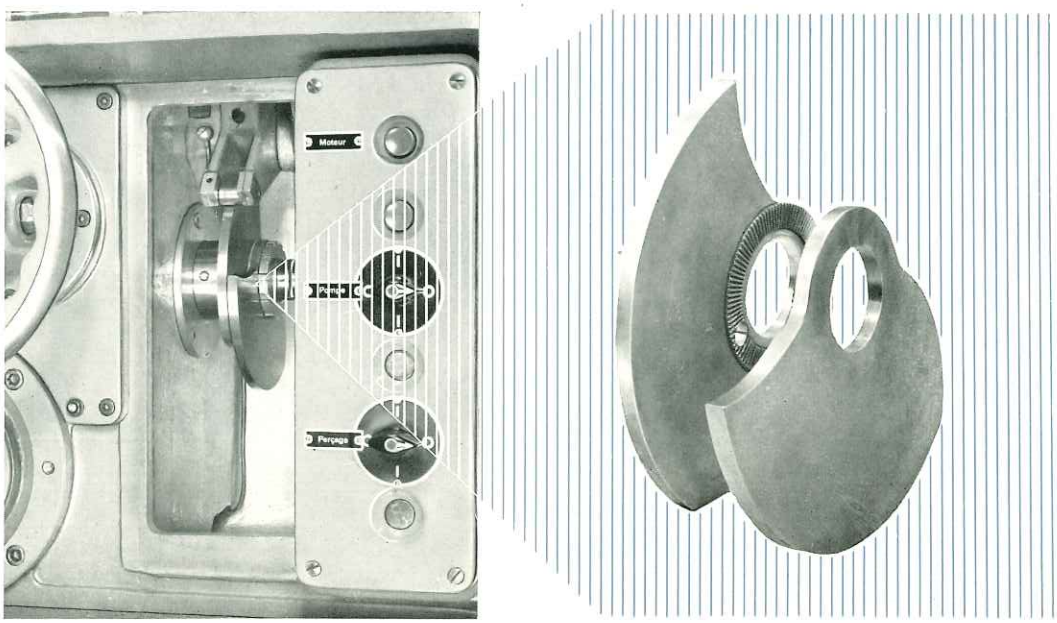
CAMS



All movements of the four slides are controlled by flat cams, independent of each other. These cams are not keyed on their shaft, but they engage with the driving pin of a 100-tooth clutch. The location of the cam on the shaft can thus be altered to ensure perfect synchronization of the slides. Since the position of the cam is adjustable as above and since the stroke of the tool can be varied with the adjustable lever ratio, it is, therefore, not necessary to cut a slide cam for each job, but the desired movements of the tools can be achieved with standard cams supplied with the machine (**27**).

The transverse movement of the front slide seldom needs adjustment of stroke or feed. It is important, however, to control the length of time the tool is in its forward position. This is easy to set with a pair of fan cams, supplied with the lathe. The concentric portion of the cam can be increased or reduced with 1/100 of cycle precision (**28**).

Once the cam is adjusted to its proper setting, it is locked on the shaft with a 100-tooth clutch, as above.



SHORT RUNS

Automatic operation is economical not only for long runs. In many cases, the TAR-H with its special time saving features will outperform a turret lathe. Two conditions are essential: **quick setups and minimum unproductive periods in the cycle.**

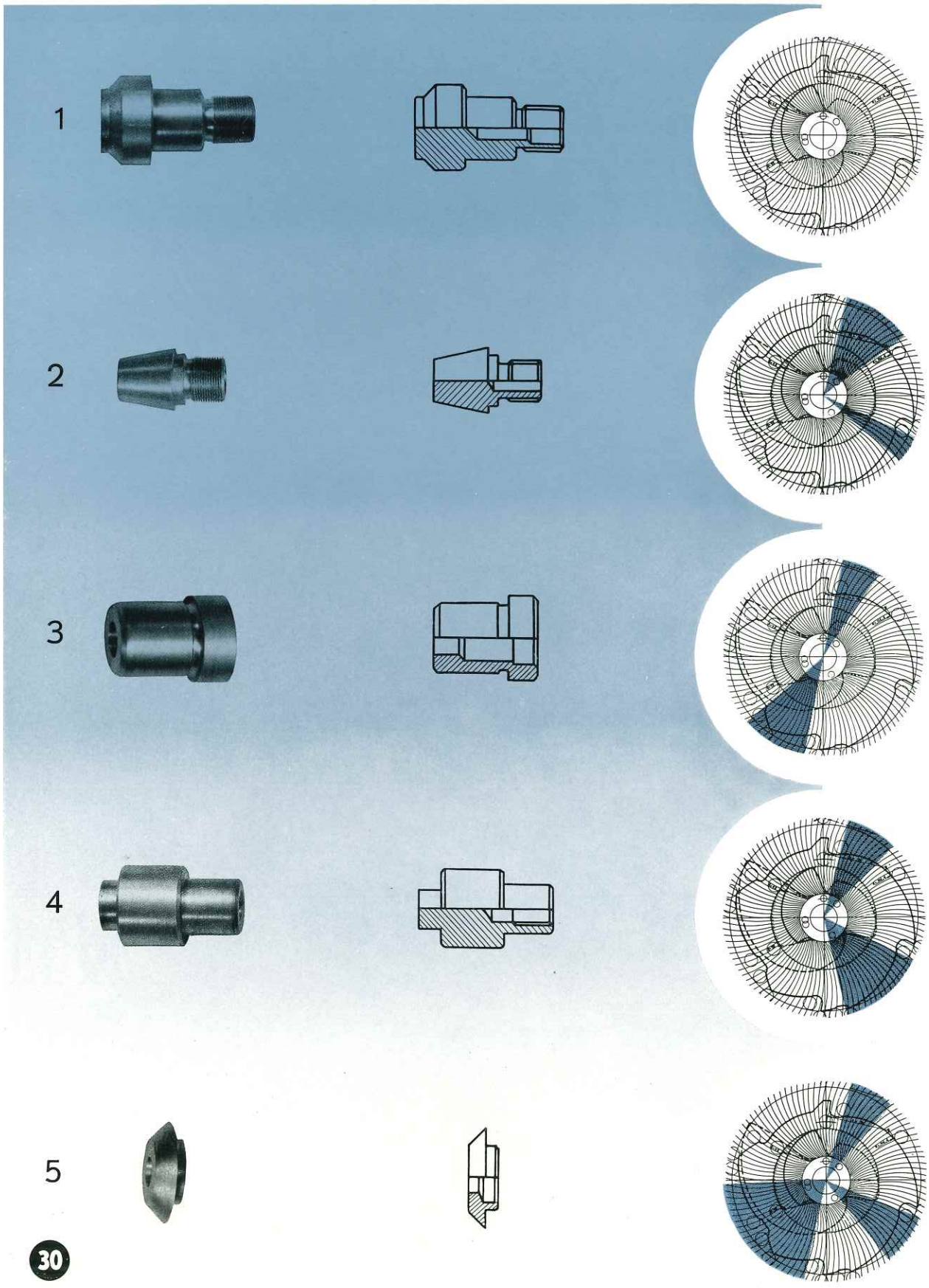
SETUPS

TAREX introduces a revolutionary procedure in screw machine practices, namely, **grouping parts into families.** A family comprises parts of various shapes and different dimensions, but with the same sequence of operations (**29**) No longer is there need to lay out and cut individual cams for each part, rather one set covers the whole familiy. In addition, the cams remain mounted on the lathe and the various setups are reduced to simple tool setting.

29

UNPRODUCTIVE TIMES

Figure (**30**) shows five parts of a typical family, each part having a different shape and a different dimension. The hole in part 1 is deeper than in part 2. The turret cam controlling drilling is laid out for part 1 and the section of this cam not required for part 2 is accelerated as shown. Similarly, acceleration can also be applied to by-pass a lobe of the turret cam for an operation on the most complicated part (threading parts 1 or 2) not required on a simpler part (part 5). Acceleration can be utilized at any time and as often as necessary by trip dogs on the timing drum, reducing the unproductive times of each part of a family to their absolute minimum. The shortening of setup times and the economy in cam cutting is also materially assisted by the **levers with adjustable ratios of arms** between the cams and the slides (see fig. (**27**). Since this adjustment permits a variation of the movement of the tool for a given lift of the cam, it is usually possible to tool up the slides with the **standard cams supplied with the machine.** Cam cutting is required for the turret only.



30

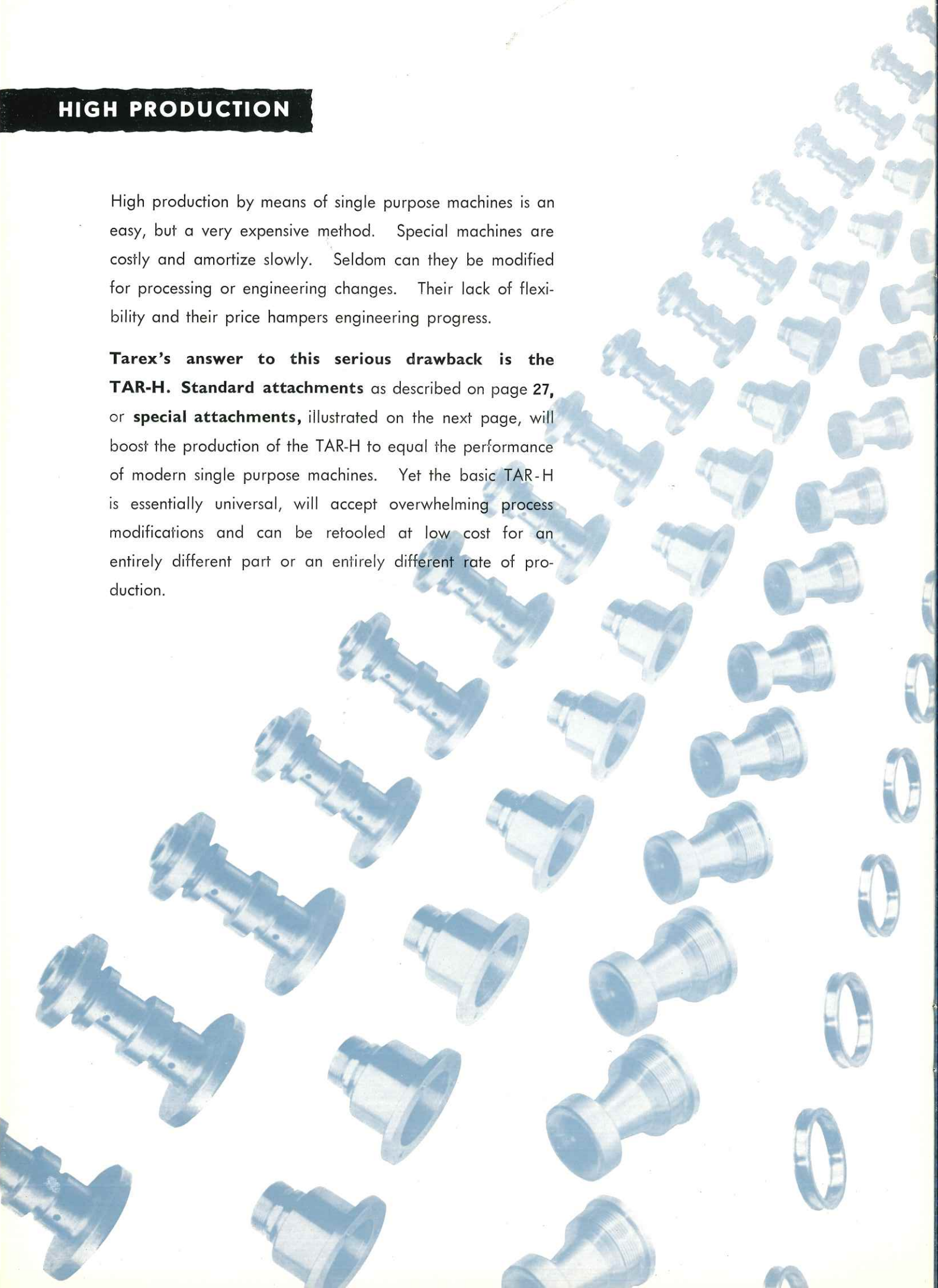
PARTS MACHINED WITH ONE SET OF CAMS

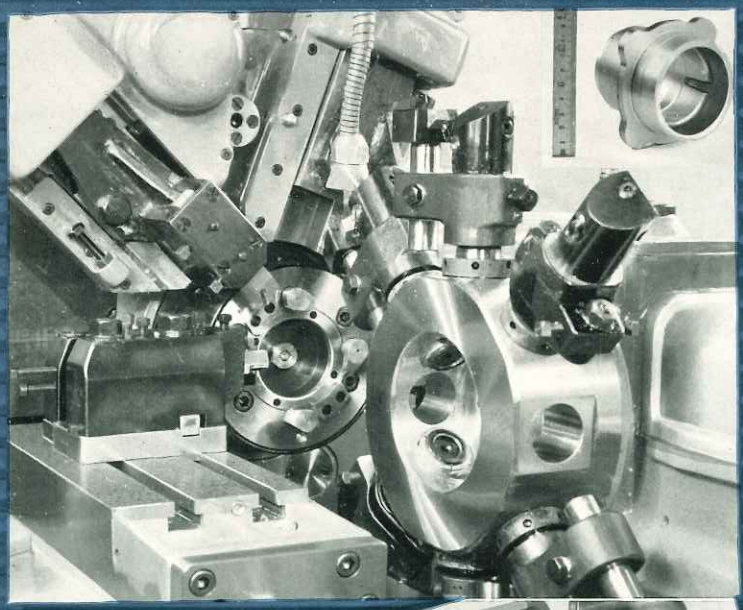
(Shaded areas are accelerated)

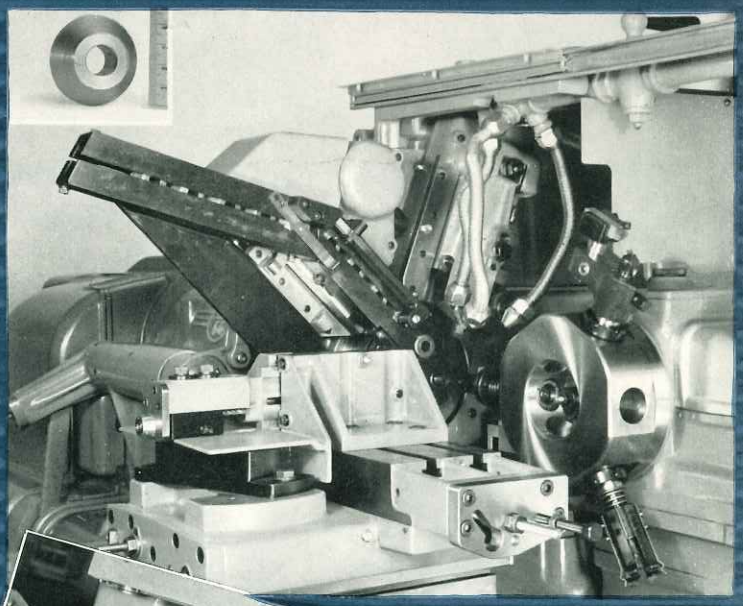
HIGH PRODUCTION

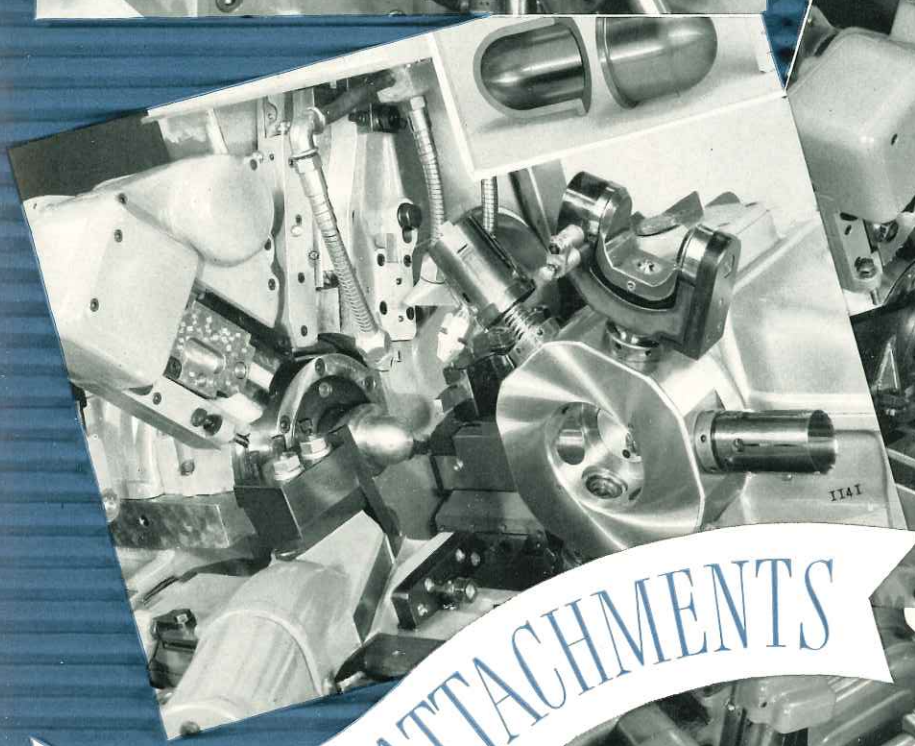
High production by means of single purpose machines is an easy, but a very expensive method. Special machines are costly and amortize slowly. Seldom can they be modified for processing or engineering changes. Their lack of flexibility and their price hampers engineering progress.

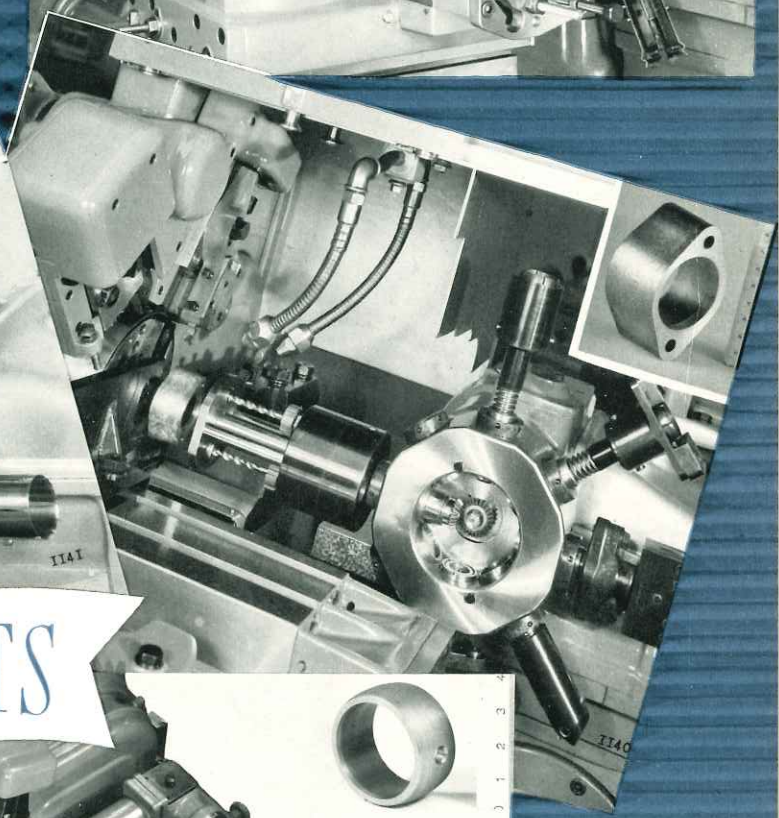
Tarex's answer to this serious drawback is the TAR-H. Standard attachments as described on page **27,** or **special attachments,** illustrated on the next page, will boost the production of the TAR-H to equal the performance of modern single purpose machines. Yet the basic TAR-H is essentially universal, will accept overwhelming process modifications and can be retooled at low cost for an entirely different part or an entirely different rate of production.



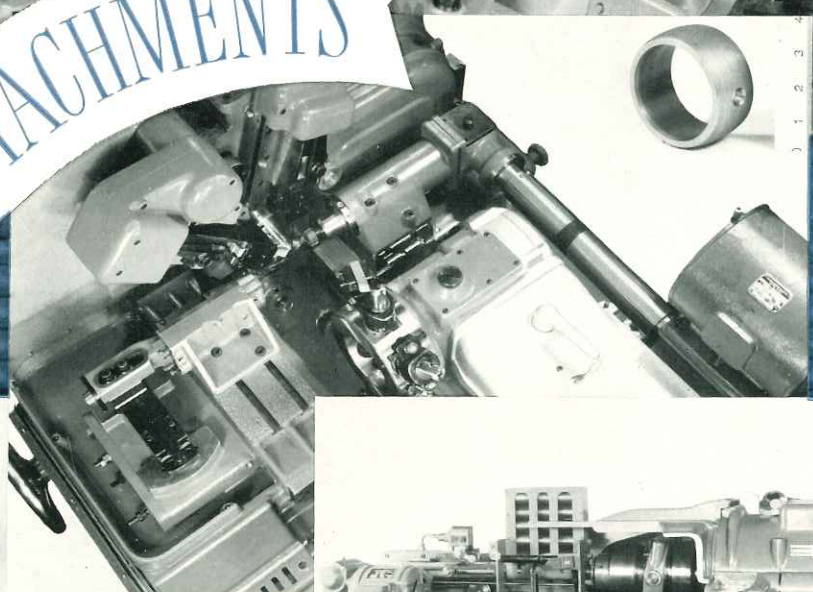


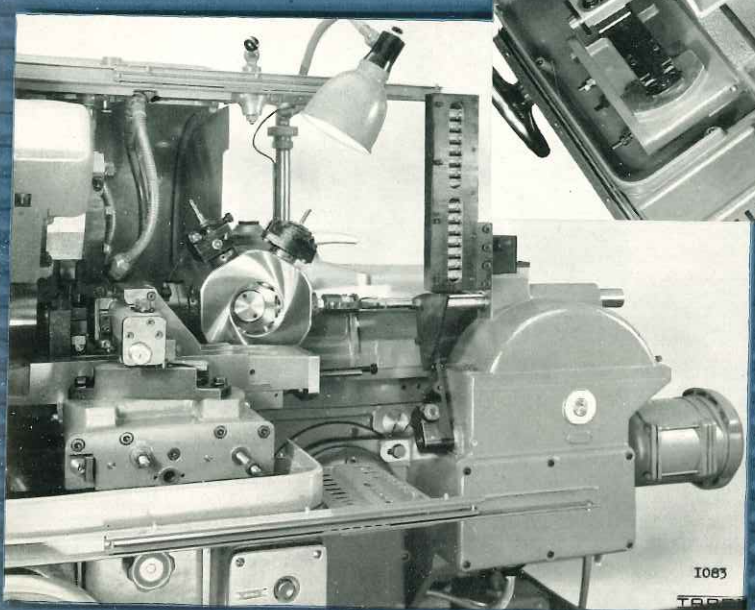


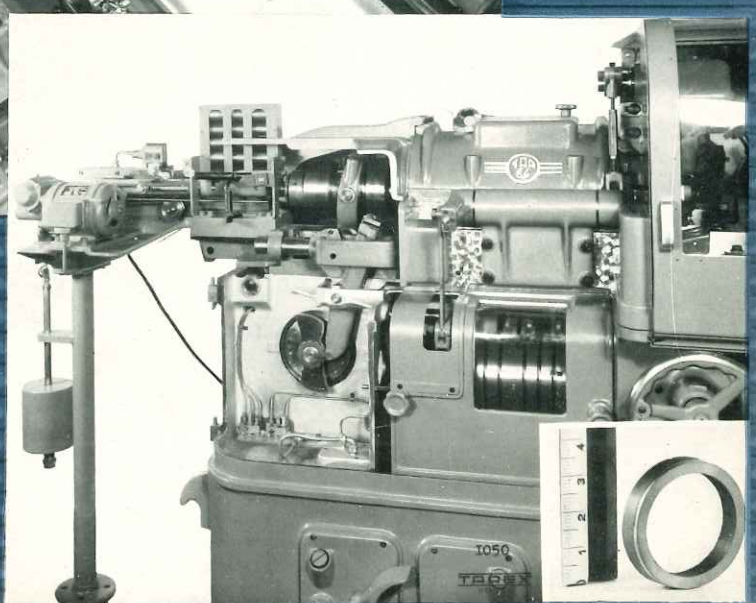




SPECIAL ATTACHMENTS

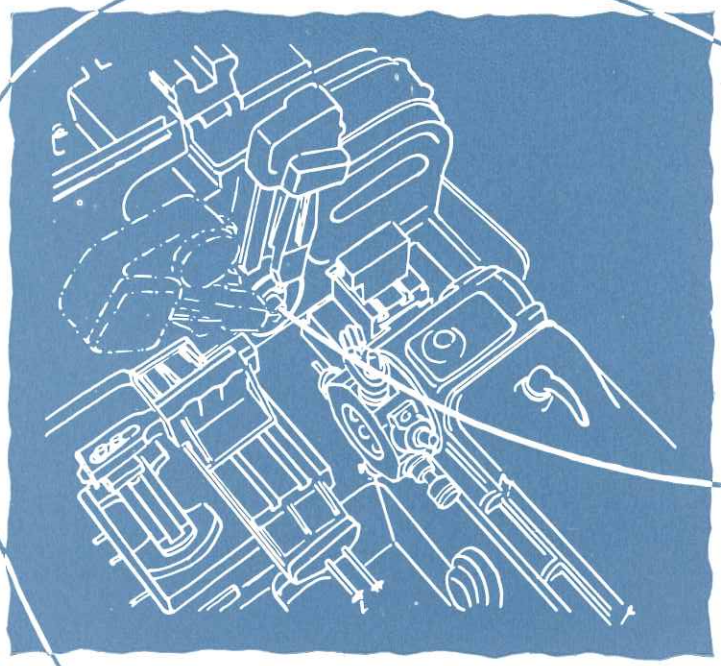






AUTOMATIC PRECISION LATHE

TAR-H



SPINDLE SPEEDS

Four automatic spindle speeds available with each pair of change gears.

Two REVERSE	2551	2027	1577	1240	1012	796	619	492
	728	579	450	354	289	227	177	140
Two FORWARD	1086	863	671	528	430	339	263	209
	310	246	192	151	123	96	75	60

PRODUCTION TIME

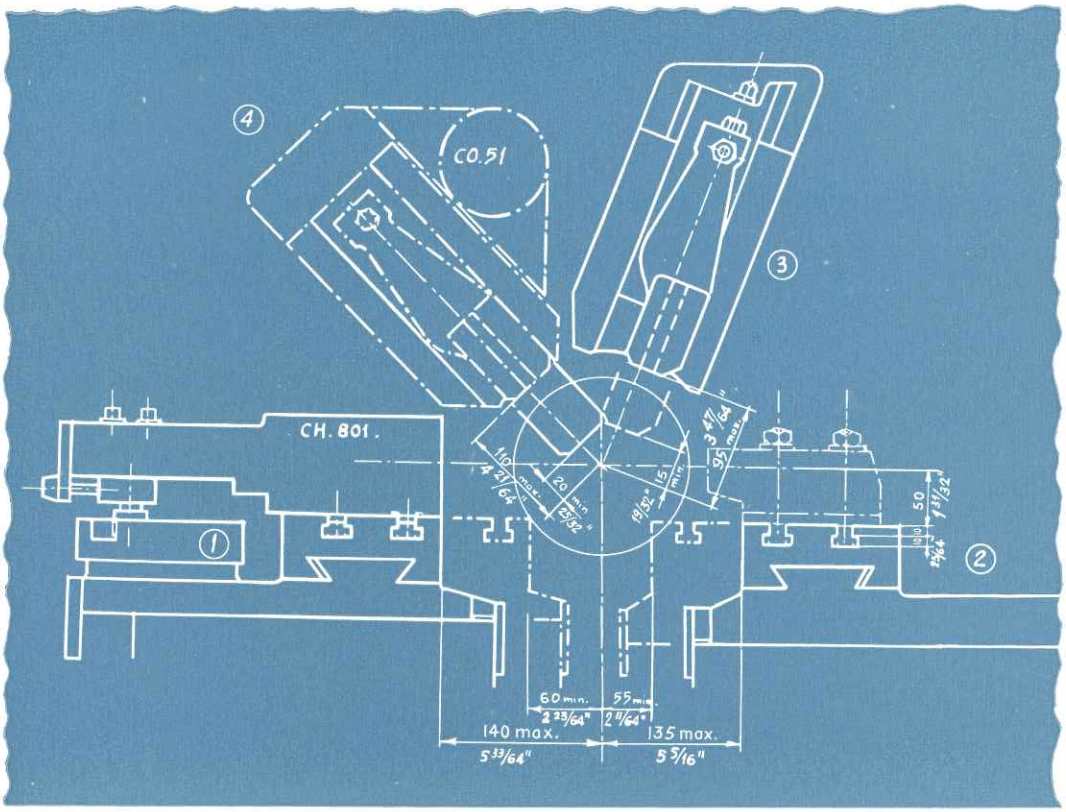
Fastest cycle 28 seconds, slowest cycle 800 seconds. 67 cycles available with the standard change gears supplied.

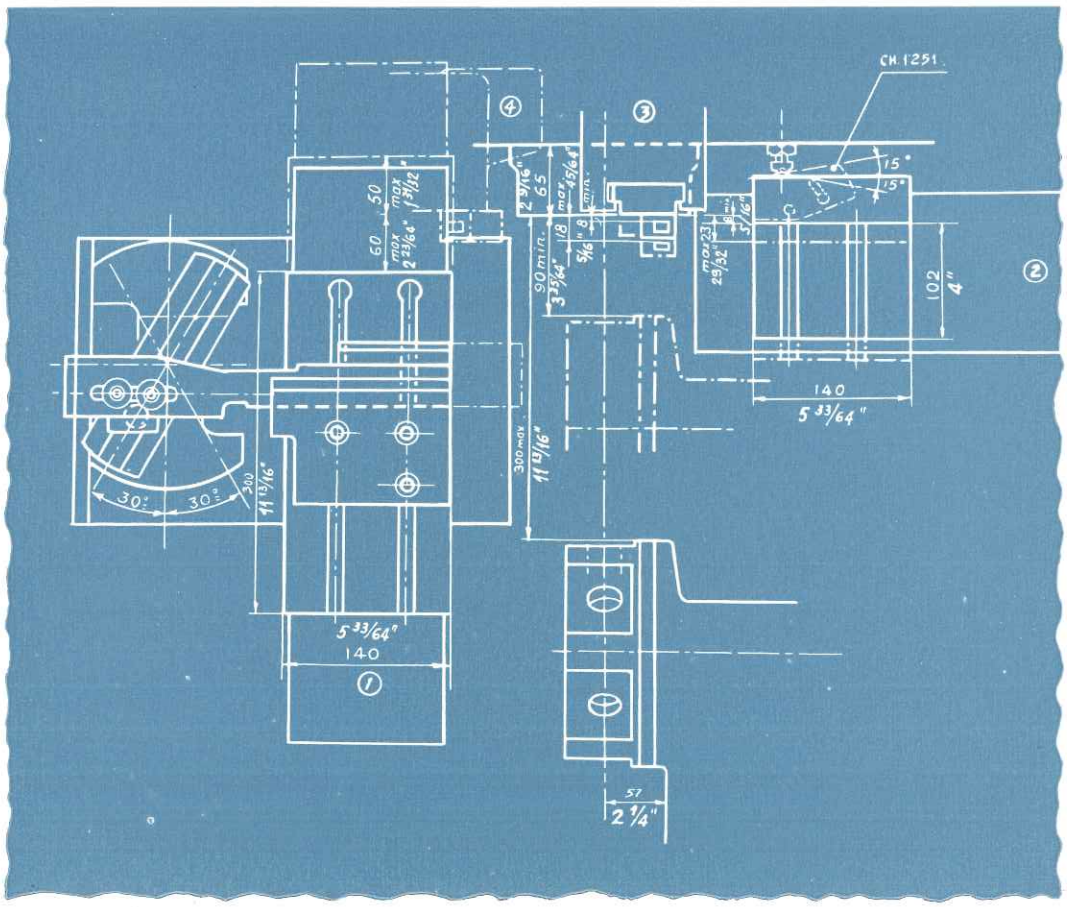
The camshaft speed can be repeatedly increased during any cycle by the automatic acceleration mechanism (Accelerator). Accelerated speed is 40 seconds for one complete camshaft revolution.

ELECTRICAL EQUIPMENT

Three phase main motor 12 HP, star delta starter. 1 HP coolant pump. 50 or 60 cycles included in basic machine quotation at no extra charge for standard voltages. Thermic and magnetic overload protection for main motor. Thermic protection for coolant pump. Push button control and lighting is 24 Volts, with transformer included.

SLIDES


CO.51
CH. 801.
140 max.
5 33/64"
135 max.
5 5/16"
60 min.
2 23/64"
55 min.
2 11/64"


CH.1251.
140
5 33/64"
102
4"
30°
30°
11 13/16"
5 33/64"
140
57
2 1/4"

TOOL TRAVELS

① FRONT SLIDE	Turning	3-15/16"
	Forming	2-11/32"
② BACK SLIDE	Forming	2-11/32"
	Longitudinal Motion	19/32"
③ VERTICAL SLIDE	Forming	2-11/32"
④ 4th SLIDE	Forming	2-3/4"

Adjustments available on all slides.

TURNING, TAPER TURNING, FORM TRACING

Front slide. Guaranteed tolerance of a cylinder turned on maximum tool travel: .0008". Single point taper turning up to 60° included angle with sliding toolholder and adjustable straight edge included in quotation of basic machine.
Open tapers or similar shapes with special templates.

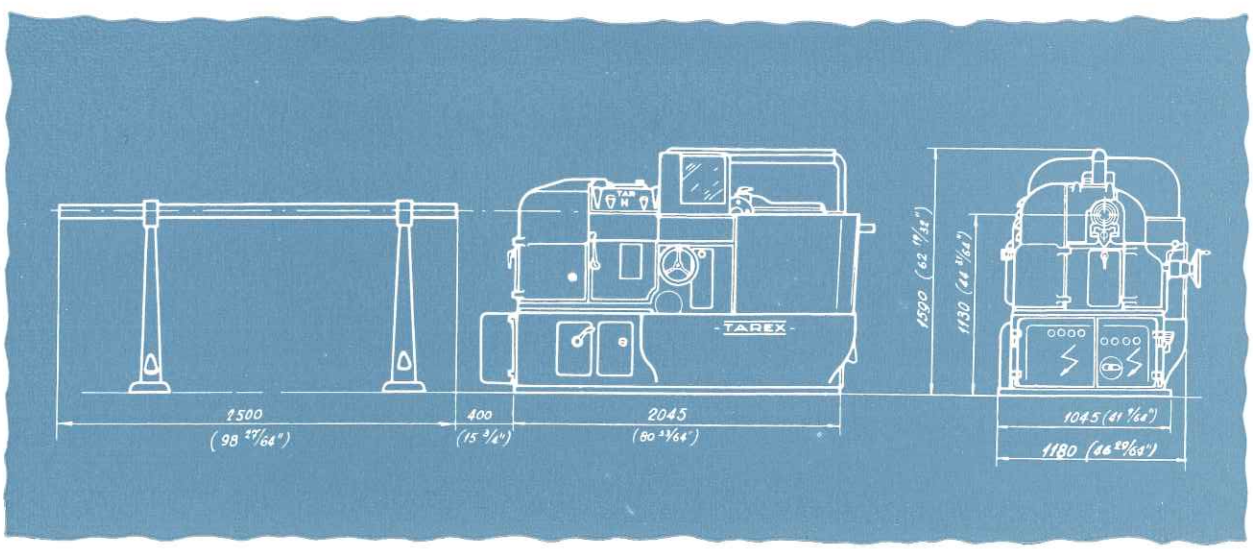
Back slide. Tapers 150° to 180° included angle or similar shapes with standard attachment (CH 1251).

TURRET

Adjustable working stroke	4-3/4"
Number of tool holes	6 or 8
Single or double indexing for 6 holes, single indexing only for 8 holes	
Tool shank, diameter	1" or 1-1/4"
Turret diameter	7.874"

SHIPPING DATA

Basic machine, unpacked	6850 lbs.	Packed for shipment	8400 lbs.
Lathe with standard equipment, crated	7700 lbs.	Box measurements	5 ft. 3 in. × 9 ft. × 6 1/2 ft.
		Volume	320 cub. feet



ALTERNATIVE STANDARD EQUIPMENTS OF THE UNIVERSAL SPINDLE

Bar Work: 64B
Collet chucking
Inside and outside feed
Silent tube and supports

Hollow Mechanical chuck: MMC
3-jaw toggle chuck, hollow
Inside and outside feed
Silent tube and supports

Mechanical chuck: MM
2 or 3 jaw mechanical chuck
Positive part ejector
Spindle brake

Pneumatic chuck: MP
2 or 3 jaw chuck, pneumatically controlled
Spindle brake

Equipments are interchangeable without modification of the spindle.

BAR WORK	64B	MMC
Round max. dia.	2.204"	1.811"
Hexagon max. across flats	1.889"	
Square max. side	1.575"	
With outside feed attachment:		
Round max. dia.	2.520"	2.047"
Hexagon	2.165"	
Square	1.772"	
Maximum feed (can be repeated)	4"	4"
Chucking tolerance	± .002"	± .020"

CHUCKING	MMC	MM	MP	
Maximum chucking diameter	6"	6"	6"	
Maximum swing	7"	7"	7"	
With reduced slide travel:				
Maximum chucking diameter	7-1/2"	7-1/2"	7-1/2"	
Maximum swing	8-3/4"	8-3/4"	8-3/4"	
Chucking tolerance	± .040"	± .040"	± .080"	
Jaw travel	.150"	.100"	.200"	
Longest piece accepted	10 ft.	10"	10"	
Maximum speed permitted with the equipment r.p.m.	2551	1500	1500	1500

SECOND OPERATION WORK

Standard second operation collets capacity up to	2-1/2"
Special 2nd op. collet, up to	6"
Expanding mandrels from	3/4" i. d. to 6" i. d.
Chucking tolerance	± .002"

MAIN STANDARD ATTACHMENTS **Ask for tenders and literature**

Outside feed attachment	AB.	51	Drill chip unloading	DD.	51
Fourth slide	CO.	51	Exhaustor and guards for grey iron work	AS.	51
Swing stop	BM.	51	Spindle brake	FB.	51
Silent stock tube and supports	TS.	51	Spindle positioning attachment	FBR.	51
Thread chasing attachment	PF.	52	etc. etc.		
Hydraulic tracer	DCH.	51			
High speed drilling attachment	PR.	51			

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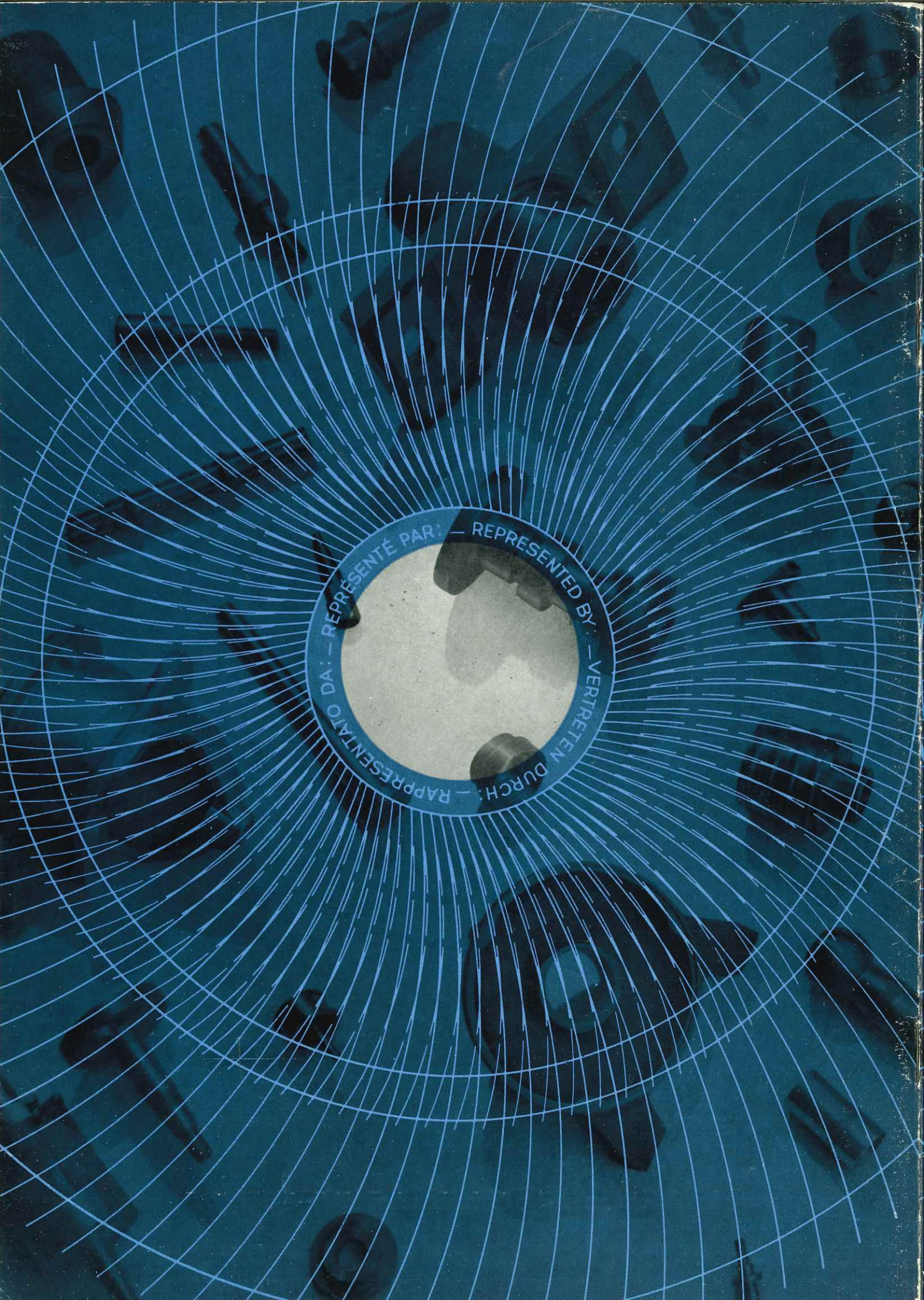
REPRESENTADO DA: — REPRESENTÉ PAR: — REPRESENTED BY: — VERTRETEN DURCH: — RAPPRESENTATO DA: